Felger, R.S., S. Rutman, C.J.S. Davis, and R. Lindley. 2015. Ajo Peak to Tinajas Altas: A flora of southwestern Arizona. Part 16. Eudicots: Malpighiaceae to Moraceae. Phytoneuron 2015-60: 1–54. Published 5 November 2015. ISSN 2153 733X

AJO PEAK TO TINAJAS ALTAS: A FLORA OF SOUTHWESTERN ARIZONA PART 16. EUDICOTS: MALPIGHIACEAE TO MORACEAE

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ABSTRACT

A floristic and natural history account is provided for six eudicot families as part of the vascular plant flora of the contiguous protected areas of Organ Pipe Cactus National Monument, Cabeza Prieta National Wildlife Refuge, and the Tinajas Altas Region in southwestern Arizona. This portion of the flora includes Malpighiaceae, Malvaceae, Martyniaceae, Molluginaceae, Montiaceae, and Moraceae. Four species are not native, three of which are established as reproducing populations. This is the sixteenth contribution for this flora, published in Phytoneuron. These contributions are also available open access on the website of the University of Arizona Herbarium: http://cals.arizona.edu/ herbarium.

This contribution to our flora in southwestern Arizona includes 6 eudicot families: Malpighiaceae (1 species), Malvaceae (25 species, 14 genera), Martyniaceae (2 species, 1 genus), Molluginaceae (2 species, 2 genera), Montiaceae (4 species, 4 genera), and Moraceae (2 species, 2 genera). The flora area covers 5141 km^2 (1985 mi^2) of contiguous protected areas in the heart of the Sonoran Desert (Figure 1).

The first article in this series includes maps and brief descriptions of the physical, biological, ecological, floristic, and deep history of the flora area (Felger et al. 2013a). This flora includes the modern, present-day taxa as well as fossil records from packrat middens. Explanation of the format for the flora series is provided in part 3 (Felger et al. 2013b). Family designations follow APG III (Angiosperm Phylogeny Group 2009; also see Stevens 2012). Non-native taxa established in the flora area are marked with an asterisk (*) and the one non-native not established in the flora area is marked with double asterisks (**). Fossil taxa are indicated with a dagger symbol (†).

All specimens cited are at the University of Arizona Herbarium (ARIZ) unless otherwise indicated by the abbreviations for herbaria at Cabeza Prieta National Wildlife Refuge (CAB), Organ Pipe Cactus National Monument (ORPI), and the standardized abbreviations for herbaria (Index Herbariorum, Thiers 2015). All photos and scans are by Sue Rutman unless otherwise stated and botanical illustrations are by Lucretia Breazeale Hamilton (1908–1986). Descriptions and keys pertain to taxa and populations as they occur in the flora area. Local distributions and growth forms are shown in Table 1.

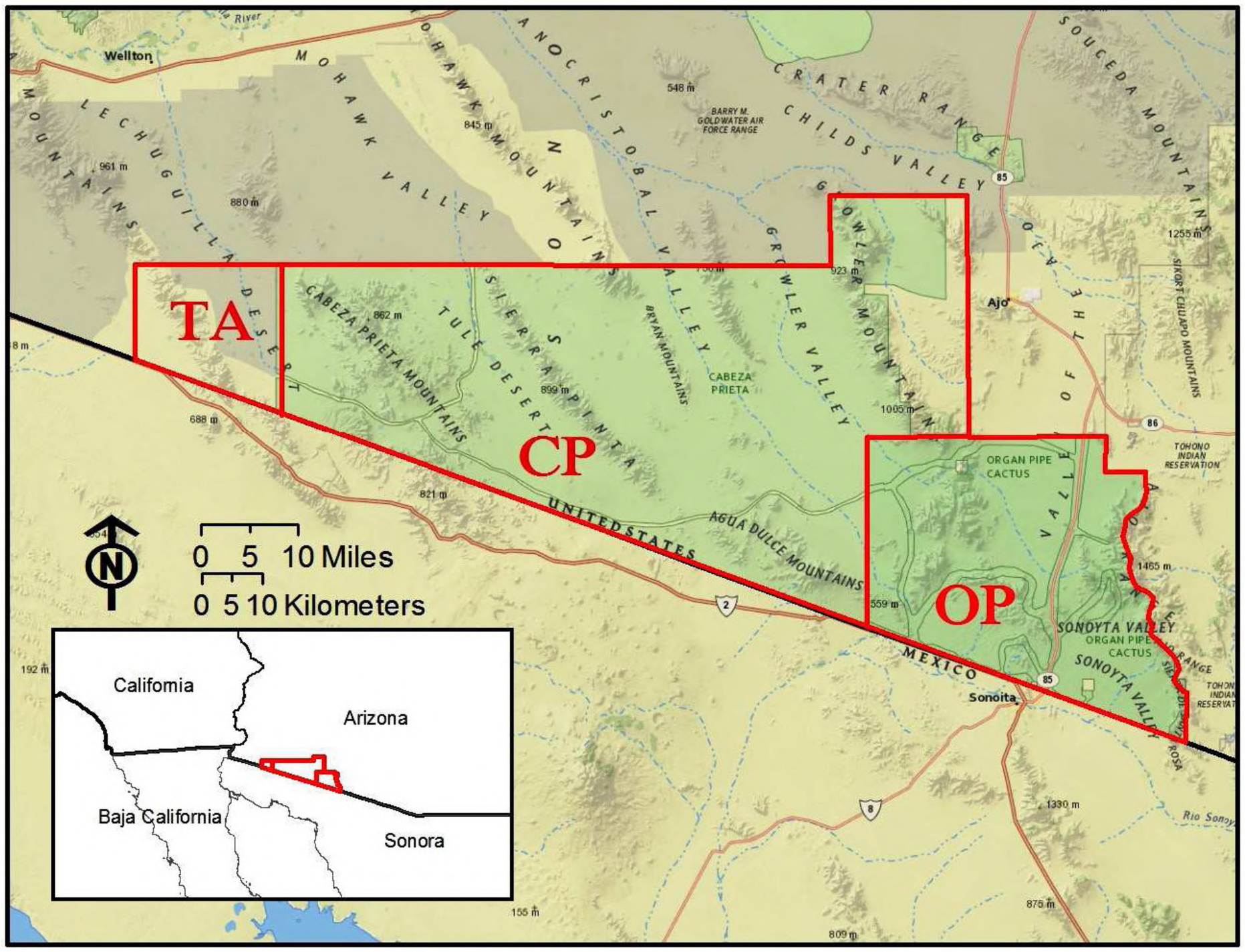

Figure 1. Flora area in southwestern Arizona. OP = Organ Pipe Cactus National Monument; CP = Cabeza Prieta National Wildlife Refuge; TA = Tinajas Altas Region. Green shading indicates approximate boundaries of federally designated wilderness.

Table 1. Local distributions and growth forms of Malpighiaceae, Malvaceae, Martyniaceae, Molluginaceae, Montiaceae, and Moraceae. † = Modern taxa also represented by fossil specimen(s); * = non-native species, ** = non-native taxon not established in the flora area. OP = Organ Pipe Cactus National Monument; CP = Cabeza Prieta National Wildlife Refuge; TA = Tinajas Altas. SU = summer/warm season ephemerals; WI = cool-season/winter-spring ephemerals; NS = non-seasonal ephemerals; AP = facultative annuals or perennials; PR = perennials. Localities and growth forms in parenthesis are taxa not locally established (not reproducing).

Taxon	Region			Growth Form				
				Ephemerals			Facultative	
	Organ Pipe	Cabeza Prieta	Tinajas Altas	Summer	Winter	Non-Seasonal	Annuals or Perennials	Perennials
MALPIGHIACEAE								
†*Cottsia gracilis*	OP	CP						PR
MALVACEAE								
Abutilon abutiloides	OP							PR
Abutilon incanum	OP	CP						PR
Abutilon malacum	OP	CP						PR
Abutilon palmeri	OP	CP						PR
Anoda pentaschista	OP			SU				
Ayenia filiformis	OP	CP					AP	
†*Ayenia microphylla*	OP							PR
†*Eremalche exilis*	OP	CP			WI			
†*Herissantia crispa*	OP	CP						PR
Hermannia pauciflora	OP							PR
Hibiscus biseptus	OP							PR
Hibiscus coulteri	OP	CP						PR
†*Hibiscus denudatus*	OP	CP	TA					PR
Horsfordia alata	OP	CP	TA					PR
Horsfordia newberryi	OP	CP	TA					PR
†*Horsfordia* sp./spp.	(OP)							(PR)
**Malva parviflora*	OP				WI			
Malvastrum bicuspidatum	OP							PR
Malvella leprosa		CP						PR
Malvella sagittifolia		CP						PR
Rhynchosida physocalyx	OP							PR
Sida abutifolia	OP						AP	
†*Sphaeralcea ambigua*	OP	CP	TA					PR
Sphaeralcea coulteri	OP	CP	TA			NS		
Sphaeralcea emoryi	OP	CP	TA				AP	
Sphaeralcea laxa	OP							PR
†*Sphaeralcea* sp./spp.	(OP)		(TA)					
MARTYNIACEAE								
Proboscidea altheifolia	OP	CP	TA					PR
Proboscidea parviflora	OP			SU				
MOLLUGINACEAE								
**Glinus radiatus*		CP		SU				
**Mollugo cerviana*	OP	CP	TA	SU				
MONTIACEAE								
Calandrinia menziesii	OP				WI			
Calyptridium monandrum	OP				WI			
Claytonia perfoliata	OP				WI			
Phemeranthus aurantiacus	OP							PR

MORACEAE								
***Ficus carica*	(OP)							(PR)
Morus microphylla	OP							PR

MALPIGHIACEAE – Malpighia Family

Herbaceous perennials, lianas, shrubs, and trees. Nearly worldwide, mostly tropical and subtropical regions; 68 genera, 1250 species.

Cottsia

Slightly woody vines, often twining in shrubs. Fruits 2- or 3-winged samaras. Southwestern USA and northwestern Mexico; 3 species. A genus segregated from *Janusia*.

Cottsia gracilis (A. Gray) W.R. Anderson & C. Davis
[*Janusia gracilis* A. Gray]
Slender janusia; *fermina*. Figure 2.

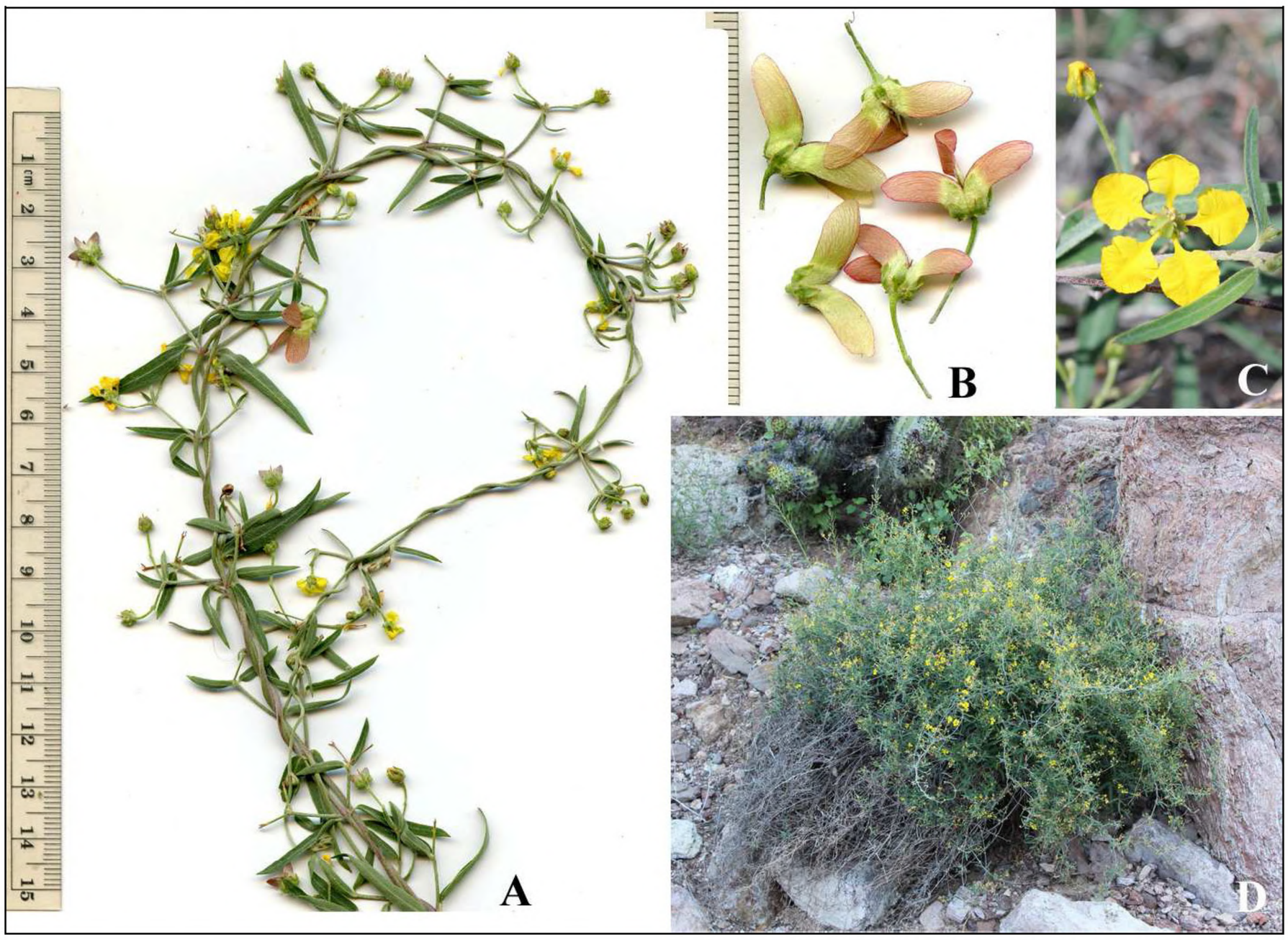

Figure 2. *Cottsia gracilis*. Alamo Canyon trail: (A) 3 Sep 2014; (B) 7 May 2006. (C) Sauceda Mts, 4 Aug 2013. (D) Diablo Canyon, 12 Sep 2013.

Perennial vines climbing 0.5–1.5 (2) m into shrubs and trees, or non-vining in open habitats and as short as 30 cm, often dying back severely in drought; moderately to densely pubescent with double hairs (T-shaped, attached in the middle with 2 opposite-pointing arms–Malpighian hairs). Stems often intertwined, slender, and tough. Leaves opposite, gradually drought deciduous, 1.5–4.5 cm long, short petioled; blades linear to narrowly lanceolate, entire, with 2 (6+) tooth-like red-brown glands 0.1–0.5 mm long near the base; stipules minute or absent. Flowers several or more in axillary clusters or sometimes solitary; pedicels jointed with 2 bractlets; flowers 11.5–13.6 mm wide, 5-

merous and weakly bilateral. Sepals green, 4 of them with paired, fleshy, oval oil glands 0.5–0.9 mm wide (in drought 2 sepals often with only 1 gland), the fifth sepal glandless. Petals and stamens bright yellow, petals 5 in number, 5–6 mm long, subequal, clawed basally, the blade margins fringed or toothed. Fruits of 2 or 3 one-winged nutlets or samaras, each 1–1.4 cm long, the wings papery, green to reddish green. The principal pollinators are anthophorid bees such as *Centris* seeking oil from the sepal glands (*see* Krameriaceae, Felger & Rutman 2015).

Mostly on rocky slopes, hills and mountains, upper bajadas, washes, and canyons scattered across much of the flora area. This small vine has a 14,500-year history in the Ajo Mountains.

Southern Arizona to west Texas, southward to central Mexico, and both states of Baja California.

OP: Walls Well, *Nichol 28 Apr 1939.* 1½ mi N of Bonito Well, 9 Apr 1941, *McDougall 57.* 5.1 mi by road NE of Visitor Center along Ajo Mtn Drive, 5 Nov 1977, *Bowers 909.* Quitobaquito, 29 Mar 1988, *Felger 88-125.* E end of Quitobaquito Hills, N-facing granitic slope, 24 Oct 1990, *Felger 90-478.* Trail from The Cones to Mount Ajo, 4090 ft, 10 Apr 2005, *Felger* (observation). †Alamo Canyon, fruit, 8,130 to 14,500 ybp (3 samples). †Puerto Blanco Mts, on ridge, fruits, 3440 to 7970 (3 samples).

CP: Childs Mt, 18 Aug 1992, *Felger 92-643C.* Base of Scarface Mt, 1650 ft, *Autenreith 20 Mar 1992* (ASC). Observations, *Felger*: 1 mi W of Refuge boundary on Charlie Bell Rd, 18 Aug 1992; N side Sheep Peak, 31 Jan 1992; N side Tule Mountains, 2 Feb 1992; Canyon at Agua Dulce Tank, Cabeza Prieta Tanks, Heart Tank, 13–15 Jun 1992.

MALVACEAE – Mallow Family (includes Sterculiaceae)

Ephemeral or perennial herbs, shrubs with soft wood (elsewhere also trees, some very large, such as *Ceiba*); mostly with stellate hairs, some also with forked or simple hairs. Leaves alternate, simple (those in the flora area) but sometimes deeply cut, stipules usually well developed. Flowers usually radial, often subtended by an epicalyx (involucel)—bracts immediately subtending the calyx, or the epicalyx absent. Calyx 5-lobed or parted; petals 5, separate except where fused basally to the stamen tube. Stamens mostly many or 5 or more, the filaments united at least basally, or more often united into a column surrounding the ovary and style, the upper portions of filaments free from the column. Fruits (those in the flora area) capsular (opening through longitudinal splits) or schizocarps (separating into single-carpel segments or mericarps).

Worldwide, mostly tropical and temperate; 240 genera, 4350 species. Mallows in the local flora include 14 genera with 25 species (Table 1). Nearly all (23 species, 92%) occur in Organ Pipe and 15 (60%) in Cabeza Prieta, and only 6 species (2.4%) occur in the hyperarid Tinajas Altas area. The majority (18 species, 72%) of the mallows in the flora area are perennials, and only 7 species are annuals.

1. Flowers minute (5–6 mm wide), the perianth maroon, with 5 fertile stamens and 5 staminodes; fruits 5 mm wide, globose, and studded with blunt spines..... **Ayenia**
1. Flowers mostly at least 10 mm wide with petals of various colors but not maroon; stamens 5 (*Hermannia*) or numerous; fruits mostly more than 5 mm long or wide, globose or not, not studded with blunt spines.

    2. Herbaceous perennials; flowers yellow, the stamens 5, the filaments united basally; capsules with 5 thin, bristly wings..... **Hermannia**
    2. Annuals/ephemerals, perennials, or shrubs; flowers of various colors including yellow, the stamens numerous, the filaments united in a column; fruits not with bristly wings as above.

3. Perennials; fruit a loculicidal capsule of 5 persistent segments each with a standing rib (septum), opening wide at maturity..... **Hibiscus**
3. Ephemerals and perennials; fruit a schizocarp, the segments (mericarps) indurate to papery and inflated, dehiscent or indehiscent, persisting or dispersing.

4. Lower leaves petioled, upper leaves of flowering branches sessile; flowering and fruiting pedicels thread-like (filiform), bent at a conspicuous joint; fruits inflated like miniature paper lanterns..... **Herissantia**
4. Lower and upper leaves petioled; pedicels usually not thread-like and mostly not bent at a joint; fruits not inflated.

5. Lower and upper portions of each mericarp markedly dissimilar, the lower chamber indehiscent, the upper part dehiscent with flared membranous wings.

6. Tall, slender shrubs; epicalyx absent..... **Horsfordia**
6. Small to tall annuals or bushy perennials or small shrubs; epicalyx present, of 3 bracts. ..... **Sphaeralcea**

5. Mericarps with a single chamber (not differentiated into upper and lower chambers).

7. Herbaceous root perennials with prominent rhizomes; leaf blades conspicuously asymmetric at base..... **Malvella**
7. Annuals or perennials, without rhizomes; leaf blades symmetric.

8. Perennials from a thick, carrot-like root; epicalyx absent; calyx enlarging and inflated in fruit..... **Rhynchosida**
8. Root not markedly thick; epicalyx present or absent; calyx not conspicuously enlarging and not inflated.

9. Epicalyx none; mericarps 5–10, 1- or 3-seeded.

10. Robust herbaceous perennials or shrubs; fruits 6–15 mm wide; mericarps 8–10, 3-seeded..... **Abutilon**
10. Ephemerals or small, delicate perennial herbs; fruits 4–5 mm wide, mericarps 5, 1-seeded.

11. Summer-fall ephemerals; lower (larger) leaves mostly more than 5 cm long, the blades relatively thick (coriaceous), ovate and often 3 lobed, the margins coarsely toothed or not; petals 10 mm long, and entire. ..... **Anoda**
11. Small annuals/ephemerals or weakly perennial herbs; larger leaves often 1.5–4 (6) cm long, the blades ovate to oblong, thin, usually cordate at base, the margins crenate-toothed; petals 5–6 mm long, shallowly notched at tip..... **Sida**

9. Epicalyx present; mericarps (8) 10–15, 1-seeded.

12. Small shrubs with slender but woody stems; epicalyx with conspicuous lanceolate bracts; corollas orange; mericarps 9–11, horseshoe-shaped with 2 dorsal cusps..... **Malvastrum**
12. Winter-spring ephemerals (annuals); epicalyx with inconspicuous filiform bracts; corollas white or pale pink; mericarps (8) 10–15, without dorsal cusps.

13. Leaf blades ovate; petals entire, not notched; fruits 4–4.5 mm wide; mericarps 12–15..... **Eremalche**
13. Leaf blades orbicular to kidney-shaped; petals deeply notched at the tip; fruits 7–8 mm wide; mericarps about 10 (11)..... **Malva**

Abutilon – Indian mallow; *Malva*

Herbaceous perennials or shrubs (those in the flora area, elsewhere also trees), the herbage usually densely pubescent with stellate hairs. Pedicels jointed (usually best seen on fruiting pedicels, the fruits usually break off at the joint). Epicalyx none. Corollas often yellow or orange. Fruit a schizocarp; mericarps 5–10, often with 3 seeds each (the mericarps are laterally fused to a greater or lesser extent and are not released). Flowering during warm months with sufficient soil moisture.

Nearly worldwide, mostly tropics and subtropics; 160 species.

1. Capsule segments (mericarps) 5, the tips blunt and rounded; calyx lobes not overlapping, the fruiting calyx shorter than the mericarps.

2. Leaf tips mostly acute-acuminate (pointed); fruiting calyx 2.8–4 mm long, ¼ as long as mericarps; petals pale orange with a maroon spot at the base..... **Abutilon incanum**
2. Leaf tips obtuse (blunt); fruiting calyx 4–6 mm long, ½ to ¾ as long as the mericarps; petals uniformly yellow-orange..... **Abutilon malacum**

1. Mericarps 7 or more, the tips slender and pointed; calyx lobes overlapping basally, the fruiting calyx about as long as the mericarps.

3. Leaf blades not especially velvety; stems and mericarps with hairs less than 0.5 mm long. ..... **Abutilon abutiloides**
3. Leaf blades soft and velvety; stems and mericarps with hairs 0.8–2.5 mm long. ..... **Abutilon palmeri**

Abutilon abutiloides (Jacquin) Garke ex Hochreutiner
Pintapán. Figure 3.

Shrubs to less than 1 m tall, the branches often spreading. Leaf blades broadly ovate, 2–10 cm long, the margins shallowly toothed. Petals, stamens, and styles yellow to pale orange, petals 1 cm long; stigmas red. Fruits 10–15 mm wide; fruiting calyx about as long as the mericarps, the mericarps 8–10, 3-seeded; carpel walls with small stellate hairs and longer simple hairs (to 1 mm long) on the upper (dorsal) margin. Seeds 3 per mericarp, 3 mm long, with minute hairs arranged in a reticulate pattern, recurved when dry, standing up straight when damp or wet. Flowering response non-seasonal.

Ajo Mountains, especially in canyons, and locally in the Puerto Blanco Mountains. Southern Arizona and Texas to Oaxaca, and the Caribbean.

Abutilon californicum Bentham is a Gulf of California segregate of the more widespread, inland, southern, and tropical *A. abutiloides*. *Abutilon californicum* extends northward to the Pinacate region in Sonora near the flora area but is not known to range into Arizona. The distinctions between these taxa are subtle differences in pubescence (see Fryxell 1988); they are geographically narrowly segregated and it remains to be seen if they intergrade at the zones of contact in Sonora.

OP: Alamo Canyon, 3 Dec 1977, *Bowers 990*. Arch Canyon, 900 m, *Felger 90-533*. Large wash draining NE slopes of Pinkley Peak, 31 Oct 2003, *Rutman 20031031-40* (ORPI).

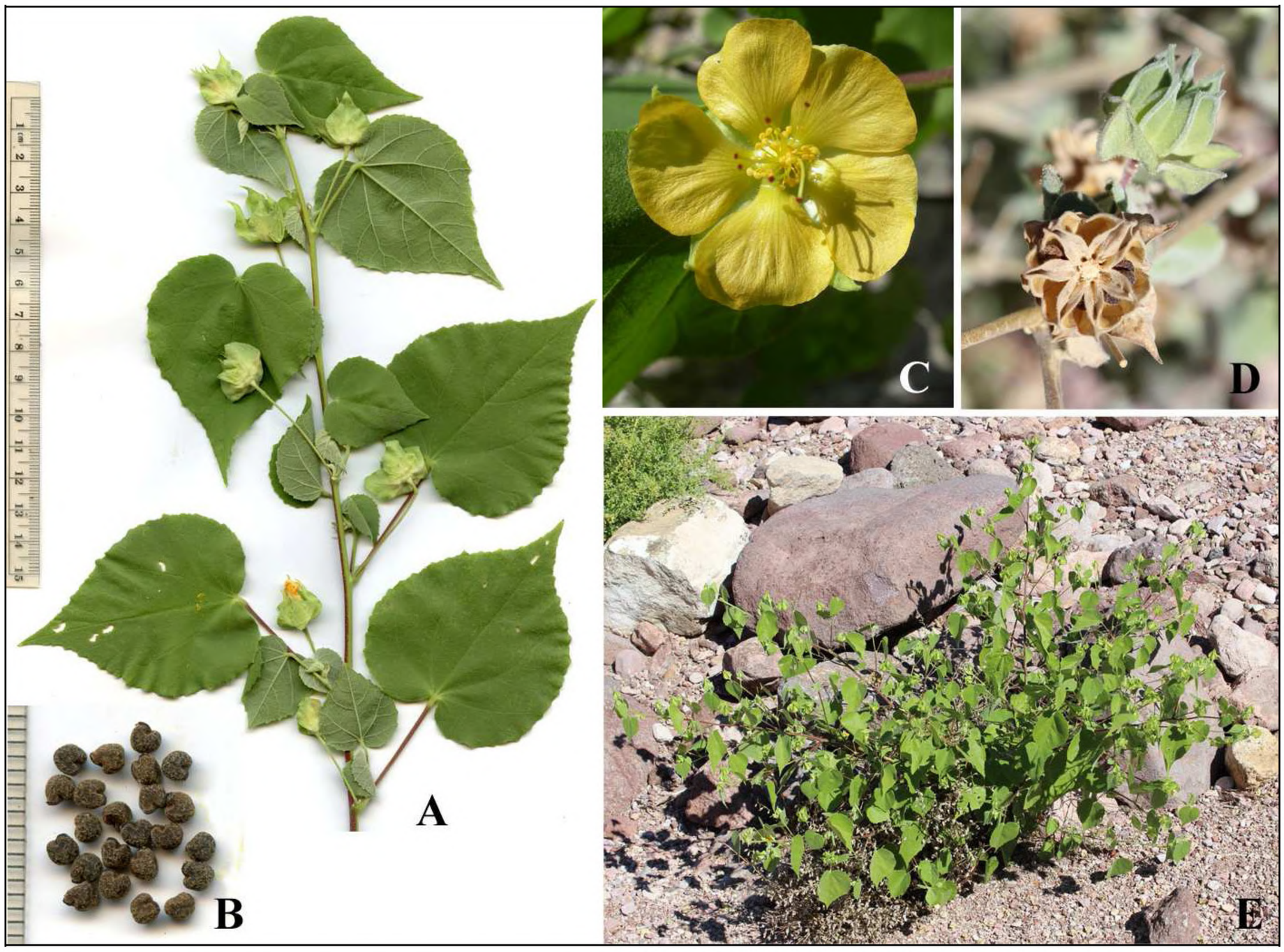

Figure 3. *Abutilon abutiloides*. Alamo Well: (A) 3 Sep 2014; (D) 26 Feb 2014; (E) 15 Sep 2013. (B) Boulder Canyon, 30 Sep 2014. (C) Below Molino Basin, Santa Catalina Mts, 13 Aug 2010, photo by Ries Lindley.

Abutilon incanum (Link) Sweet
[*A. pringlei* Hochreutiner]
Pelotazo. Figure 4.

Shrubs often 1–1.6 m tall with slender, upright stems; densely and velvety pubescent with minute stellate hairs. Petioles prominent; leaf blades ovate, often 3–10 cm long, cordate at the base, acute to acuminate at the tip, greener above, gray-green below, the margins toothed. Flowers solitary in leaf axils and in large, open, terminal inflorescences. Pedicels often jointed 2.5–3 mm below the calyx, the pedicel usually thickened above joint even in bud. Corollas pale orange with large maroon spots in the center; petals 4–6 mm long, reflexed with age; filaments red below, yellow above; stigmas red. Fruits 6.5–8 mm × 5–7 mm; mericarps 5, blunt tipped, nearly always 3-seeded; fruiting calyx 2.8–4 mm long.

Canyons and rocky slopes, often north facing, in ranges along the east side of Cabeza Prieta and widespread in Organ Pipe.

Arizona, New Mexico, and Colorado and northwestern Mexico in both states of Baja California, Sinaloa, and Sonora, and disjunct in Hawaii.

OP: Alamo Canyon, 17 Dec 1939, *Harbison 26264*. Dripping Springs, 16 Apr 1952, *Parker* 7906. Estes Canyon, *Hesselberg 16 Oct 1966*. Foothills of Santa Rosa Mts, W of Diaz Peak, 2 Apr 2003, *Rutman 2003-440* (ORPI). Senita Basin, *Warren 10 Apr 1975*.
CP: Agua Dulce Mts, 14 Sep 1992, *Felger 92-728*.

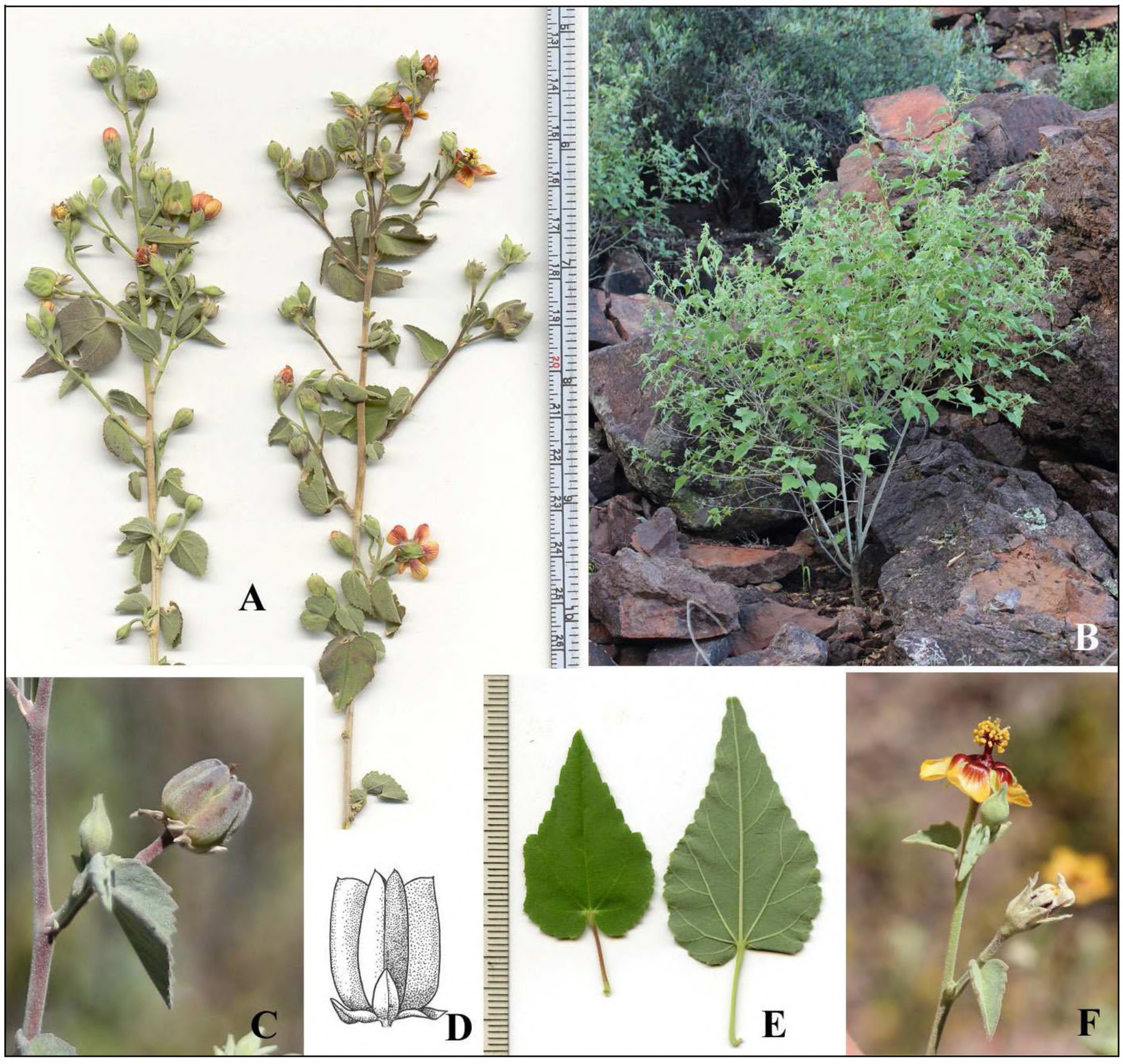

Figure 4. *Abutilon incanum*. Alamo Canyon: (A) 24 Mar 2008; (C) 26 Mar 2005; (F) 26 Feb 2014. (B) Bull Pasture Trail, 8 Sep 2014. (D) By Lucretia Breazeale Hamilton. (E) Diablo Canyon near Ajo Mountain Drive, 30 Sep 2014.

Abutilon malacum S. Watson
Yellow Indian-mallow. Figure 5.

Shrubs 0.5–1 m tall; densely, velvety, and minutely stellate pubescent. Petioles prominent; leaf blades often 1.5–6 cm long, broadly ovate to orbicular, cordate at base, obtuse at tip, dull green above, somewhat yellow-green below with prominent raised veins, the margins toothed. Flowers solitary in leaf axils or in few-flowered terminal inflorescences. Pedicels 12–30 mm long, the joint often 2–9 mm below the calyx base, the joint occasionally obscure, the pedicel usually thickened above the joint. Corollas and stamens uniformly yellow-orange, the corollas spreading, 1.5 cm wide. Fruiting calyx 4–5 mm long. Fruits 6–8 mm wide and long; mericarps 5, the tips blunt, 3-seeded.

Canyons and rocky slopes in Organ Pipe and the eastern part of Cabeza Prieta.

Southern Arizona to Texas, and southward to northern Sonora and San Luis Potosí.

OP: 40 mi Drive, in *Olneya* and *Acacia* thicket, 12 Jul 1962, *Ranzoni 192* (ORPI). Pinkley Peak, *Wirt 11 Nov 1988*. Puerto Blanco Mts, *Wirt 17 Sep 1990*.

CP: Cabeza Prieta Tanks, 6 Apr 1979, *Lehto L23521*. Scarface Mt, 1650 ft, *Autenreith 20 Mar 1992* (ASC). Canyon of Agua Dulce Spring, 26 Feb 1993, *Felger 93-87*. N bajada of Little Ajo Mts at Charlie Bell Road, 5 Sep 2014, *Rutman 20140905-7*.

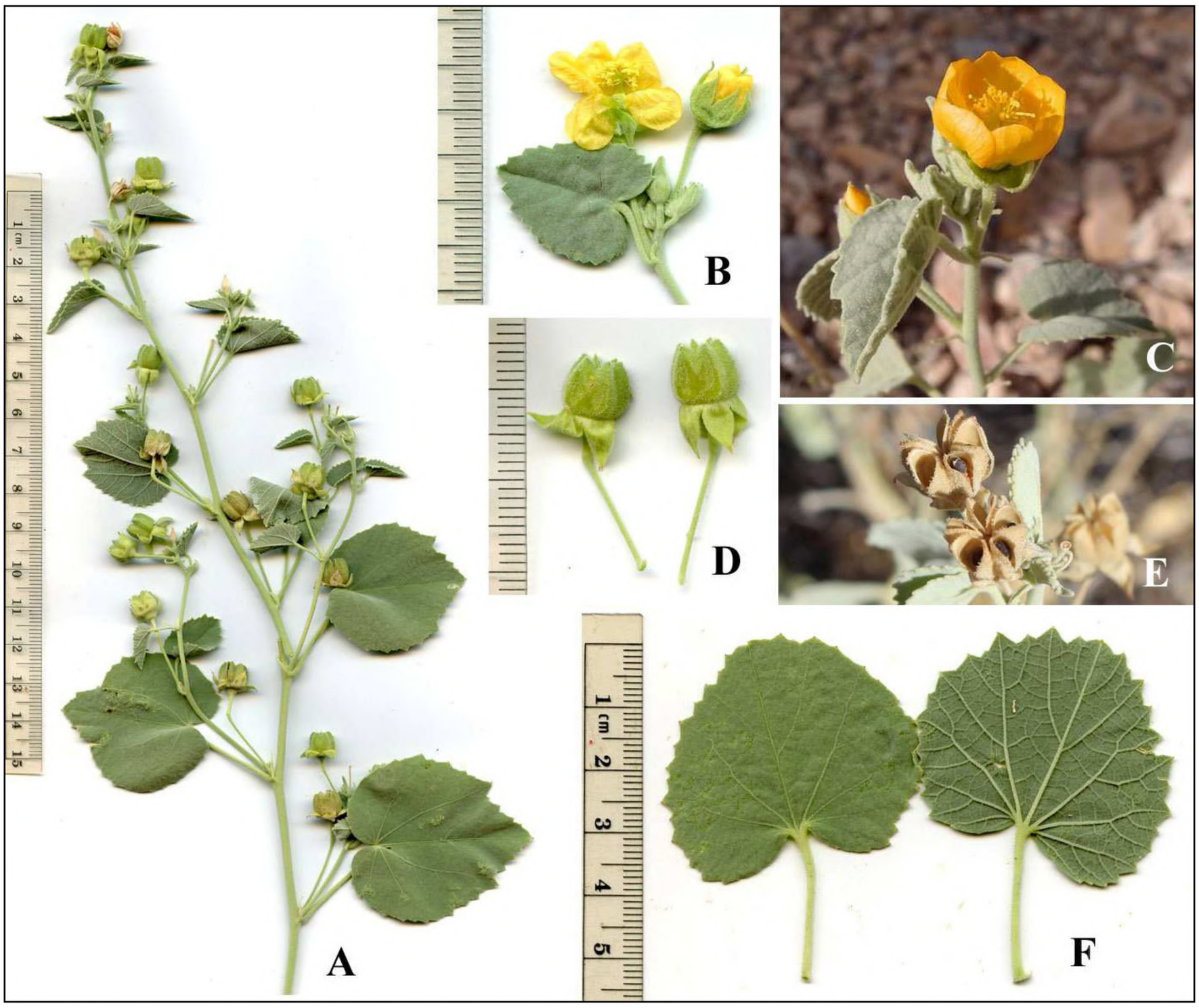

Figure 5. *Abutilon malacum*. (A & F) Sierra Los Tanques, Sonora, 7 Sep 2014. (B & D) Foothills of Little Ajo Mts at Charlie Bell Road, 5 Sep 2014. (C) Waterman Mts, Ironwood Forest National Monument, 23 Feb 2014, photo by Sue Carnahan. (E) Wash crossing Ajo Mountain Drive, Diablo Mts, 17 May 2015.

Abutilon palmeri A. Gray
[*A. aurantiacum* S. Watson, not *A. aurantiacum* Linden ex Turczaninow. *A. macdougalii* Rose & Standley]
Palmer's Indian-mallow. Figure 6.

Sparsely branched, open and scarcely woody subshrubs to 1.5+ m tall; densely stellate pubescent and also with longer simple hairs. Petioles of larger leaves (2.5) 4–13 cm long; leaf blades conspicuously soft velvety, broadly ovate to nearly orbicular, light green above and lighter colored below, the larger ones 4.5–15 cm long, minutely to coarsely toothed, deeply cordate at base, acuminate-acute to obtuse at tip. Flowers showy, in large, slender-stemmed, open and sparsely branched terminal panicles rising well above the foliage, and also solitary in leaf axils. Pedicel length highly variable, the joint often inconspicuous at flowering time, the pedicel often thickened above joint and usually conspicuous at fruiting time. Petals pale orange, 2–2.5 cm long. Fruiting calyx about as long as the mericarps; fruits 13–15 mm wide, the mericarps about 10, 3-seeded.

Canyons in the Cabeza Prieta Mountains and mountains in Organ Pipe.

Southwestern Arizona to Sinaloa, and southeastern California to Baja California Sur; disjunct in Tamaulipas.

OP: 10 mi S of Bates Well, 5 Mar 1940, *Benson 9923*. Alamo Canyon, 14 Mar 1941, *Benson 10686*. Dripping Springs, 16 Apr 1952, *Parker 7948*. Canyon Diablo, 13 Feb 1978, *Bowers 1056*.
CP: Cabeza Prieta Tanks, 6 Apr 1979, *Lehto L23521* (ASU).

Figure 6. *Abutilon palmeri*. Ajo: (A) 6 Mar 2015; (B) 4 Mar 2006; (C) 20 Sep 2014. (D) Estes Wash, 0.5 mile S of Estes Canyon trailhead, 12 Sep 2013.

†Abutilon sp.
OP: †Puerto Blanco Mts, on ridge, capsule, 3440 ybp.
TA: †Tinajas Altas, mericarp fragments, 5860 to 11,040 ybp (3 samples).

Anoda

Ephemerals or perennial subshrubs. Americas and Australia, mostly in Mexico, 23 species.

Anoda pentaschista A. Gray
Field anoda. Figure 7.

Summer-fall ephemerals; erect-growing, slender and generally sparsely-branched; sometimes reaching 1 m tall. Younger stems sparsely stellate-tomentose or glabrate. Leaf blades relatively thick, highly variable, the lower leaves often broadly lanceolate, toothed, and sometimes with 2 large, basal lobes, the larger leaves often reaching 10+ cm long and soon deciduous, the upper leaves substantially smaller, narrower, and often linear. Floral bracts (epicalyx) absent. Flowers small, calyx 3–5 mm long. Petals 1 cm long, yellow-orange. Fruits schizocarps, globose-depressed (oblate, flattened at each end), 4–5+ mm wide; mericarps usually 5, the lateral walls disintegrating at maturity.

Figure 7. *Anoda pentaschista*. Bull Pasture: (A & C) 21 Sep 2008; (B) 24 Sep 2006.

Known in the flora area only from Bull Pasture and Arch Canyon in the Ajo Mountains. This is the westernmost record for this species.

Eastward across southern Arizona to Texas and through much of Mexico, often in disturbed habitats. Weedy and not native in southeastern California.

OP: Bull Pasture: 3020 ft, *Wirt 12 Aug 1990*; Vicinity of the weather station, *Rutman 24 Sep 2006.* Trail to the arch in Arch Canyon, 12 Sep 2014, *Rutman*, photo.

Ayenia

Shrubs or herbs with stellate hairs. Leaves simple, the margins toothed or serrated. Flowers pedicelled, axillary, minute, reddish and intricately sculptured. Calyx 5-lobed, somewhat petal-like. Petals 5, the tips united with the stamen tube; stamens united in a short column bearing 5 fertile stamens and 5 sterile stamens (staminodes). Fruits of small, rounded capsules, studded with blunt spines or tubercles, 5-celled, at maturity separating into five 1-seeded carpels. Americas; 80 species.

1. Ephemerals or dwarf subshrubs, often few branched or with many short, non-woody stems and the plants less than 40 cm tall; leaves often longer than wide; capsules with a stipe (the fruit "stalk" above an obvious joint; the part below the joint is the actual pedicel) 1.4–2 mm long..... **Ayenia filiformis**
1. Shrubs 0.5–0.8+ m tall, with many rigid, spreading and slender but woody branches; leaves often about as wide and long; capsules with a stipe 0.2–0.6 mm long..... **Ayenia microphylla**

Ayenia filiformis S. Watson

[*A. pusilla* of various authors, not *A. pusilla* Linnaeus. *A. compacta* Rose]. Figure 8.

Ephemerals to dwarf perennials with slender mostly erect stems, often few-branched, sometimes to 50 cm tall but usually much shorter, especially when grazed and then often with rigid, stubby, and spreading branches. Plants with simple and stellate hairs, sometimes sparsely pubescent especially with ample soil moisture and when shaded. Leaves drought deciduous, petioled, 1–3.8 cm long, the dry-season leaves reduced; leaf blades linear to narrowly lanceolate, or sometimes elliptic to ovate, the margins toothed. Flowers axillary, minute, the calyx green and maroon, the petals maroon; flowering response non–seasonal except during colder weather. Capsules rounded, 4.6–5 mm wide, with blunt spines (tubercles) and stellate hairs. Seeds dark red-brown to nearly black, 2.5–3 mm long, resembling a beetle pupa. Growing with warmer weather, especially with summer-fall rains.

Unevenly scattered in mountains and hills, often in rock crevices. Plants often severely browsed, perhaps by desert bighorn and also by chuckwallas. Compact, dwarfed plants in drier habitats, such as lower elevations in Organ Pipe and probably in the central or western part of Cabeza Prieta, may be identified as *A. compacta*, distinguished by shorter tubercles (projections) on the capsules, but it seems scarcely distinct from *A. filiformis* (Felger 2000).

Western and southern Arizona, southeastern California, New Mexico, western Texas, both states of Baja California, and Sonora to Sinaloa, Coahuila, and Zacatecas.

OP: Dripping Springs, 29 Jan 1978, *Bowers 1020*. Bull Pasture Trail, 2500 ft, 9 May 1979, *Bowers 1703*. Diablo Canyon, 12 May 1988, *Baker 7607* (ORPI). Senita Basin, *Rutman 10 Oct 1995* (ORPI). Diablo Mts, 807 m, shaded base of N-facing cliff, 22 Sep 2013, *Rutman 20130922-25*.

CP: Tule Tank, 14 Apr 1992, *Harlan & Steinmann 292* (CAB). Vicinity of Agua Dulce Pass, 14 Sep 1992, *Felger 92-736*.

Figure 8. *Ayenia filiformis*. Arch Canyon Trail: (A) 21 Sep 2008; (F) 16 Sep 2006. (B) Alamo Canyon, 9 Sep 2013. (C) Rancho la Proveedora, Caborca, Sonora, 1 Mar 2013. (D) Cerro Trincheras, Trincheras, Sonora, 3 Mar 2015. (E) Bull Pasture Trail, 19 Sep 2014. Photos C & D by Sue Carnahan.

Ayenia microphylla A. Gray
Shrub ayenia. Figure 9.

Subshrubs, usually less than 1 m tall, with many slender, spreading, and rigid stems. Plants with stellate hairs, those on the stems have appressed arms. Leaves short-petioled, the blades mostly 3–10 mm long, broadly ovate to rounded, the margins toothed. Flowers reddish and green, minute, flowering during warmer months. Capsules about 5 mm wide, with blunt spines (tubercles) and stellate hairs. Seeds 3 mm long.

Ajo, Diablo, and Puerto Blanco mountains; usually rather localized. It has been in the Ajo Mountains for at least 12 centuries.

Southern and central Arizona to western Texas, Sonora, and the Chihuahuan Desert Region in northern Mexico.

OP: Arch Canyon, 10 Apr 1949, *Fouts 441*. Canyon Diablo, 15 Apr 1951, *Supernaugh 441* (ORPI). Main campground, 1 mi SW of Visitor Center, 13 Sep 1978, *Bowers 1523* (ORPI). Foothills ENE of Pinkley Peak, 31 Oct 2003, *Rutman 20031031-32* (ORPI). †Alamo Canyon, leaves, seeds, 1150 ybp.

Figure 9. *Ayenia microphylla*. (A) Base of Pinkley Peak, 8 Aug 2013. (B) Foothills of Rincon Mts, Vail, Pima Co., 20 Jul 2013, photo by Jillian Cowles (SEINet). (C) Desert View Trail, near Twin Peaks Campground, 12 Mar 2015.

Eremalche

Annuals. Southwestern USA and northwestern Mexico; 3 species.

Eremalche exilis (A. Gray) Greene
White mallow. Figure 10.

Spring ephemerals with stellate hairs less than 0.5 mm long and some simple hairs. Stems to 60 cm long, several to many, mostly branching from near the base, spreading to decumbent, slender, and often few-branched. Leaf blades palmately 3- or 5-lobed, the lobes divided to toothed or entire. Flowers axillary and solitary. Epicalyx of 3 bractlets, persistent, separate, linear, and about ⅔ as long as the calyx. Pedicels often longer than the leaves. Calyx 4–6 mm long. Petals 3–5 mm long, white to pale lavender and without basal spots. Fruits globose-depressed, 4–4.5 mm wide; mericarps 12–15, blackish, 1.5–1.8 mm wide, margins sculptured, indehiscent or eventually the thin lateral walls rupturing, 1-seeded, the seed filling the central cavity of the mericarp.

Sandy soil plains and low, stabilized dunes near the international border in Cabeza Prieta and more widespread in nearby northwestern Sonora. Also in sandy washes in the Ajo Mountains and the northern part of Organ Pipe in 1939 and 1941 and not recorded there since,

Western and southern Arizona, southern California, Utah, Nevada, Baja California, and northwestern Sonora.

The plants were cooked as greens with wheat flour by the Gila River Pimas as emergency food (Rea 1997; see *Malva parvifolia*).

OP: Alamo Canyon, *Nichol 26 Mar 1939*. Wash near Sonoyta road, 10 Apr 1941, *McDougall 70*.
CP: Dunes, E edge of Pinacate Plateau, 30 Mar 1938, *Wiggins 6557* (RSA). Pinta Sands, 10 April 1978, *Reeves 6787* (ASU).

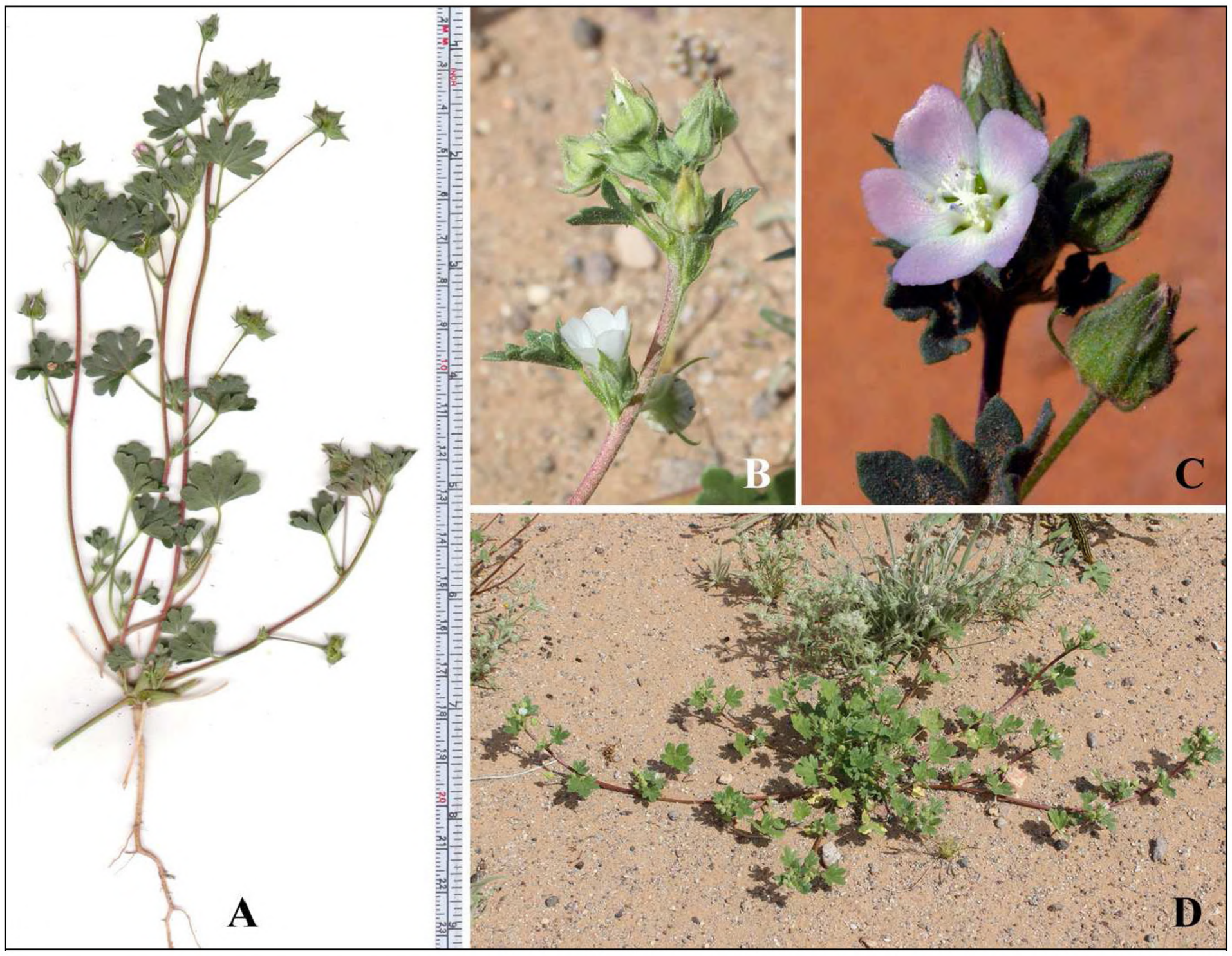

Figure 10. *Eremalche exilis*. (A) Estes Canyon, 3 Apr 2010. (B & D) Lago Seco, Barry M. Goldwater Range, Maricopa Co., 18 Mar 2014. (C) Pinta Sands E of lava flow, 9 Apr 2010, photo by Henry (Hank) Jorgenson (SEINet).

Eremalche rotundifolia (A. Gray) Greene

This winter-spring ephemeral is common in nearby northwestern Sonora and west and north of the flora area in Arizona. Often found on sandy soils, it has relatively large flowers, and the petals are pink with dark maroon basal spots.

Herissantia

Annual and perennial herbs, and shrubs. Warm regions of the Americas; 5 species.

Herissantia crispa (Linnaeus) Brizicky
[*Abutilon crispum* (Linnaeus) Medicus. *Bogenhardia crispa* (Linnaeus) Kearney]
Bladder mallow. Figure 11.

Perennial herbs to sub-shrubs, also flowering in the first year or season. Stems slender and weak, upright to trailing, arching or semi-vining and often growing through shrubs, sometimes to 1 m long from a scarcely woody base. Hairs soft and stellate, sometimes also with long straight hairs. Leaves long petioled on vegetative stems, the blades broadly ovate, relatively thin, 3–7 cm long, the

base cordate, the tip acute to acuminate-acute, the margins crenate-toothed; stipules (2) 3–7 (10) mm long, string-like, green, and relatively persistent; leaves sessile and usually much smaller on flowering stems. Flowers solitary in leaf axils, the flowering and fruiting pedicels slender and conspicuously jointed, with a prominent elbow-like bend at the joint (the pedicels bend conspicuously downward, unlike in *Abutilon*, which remain erect). Epicalyx absent. Flowers 1.5 cm wide, the petals pale yellow-orange. Fruits globose, inflated, 1.3–1.5 cm wide, papery, resembling a miniature paper lantern, mericarps separating at maturity. Flowering and fruiting mostly during warm, moist weather.

Figure 11. *Herissantia crispa*. (A) Estes Canyon, 11 Sep 2008. (B & C) Cerro Proveedora, Rancho Puerto Blanco, Caborca, Sonora, 1 Mar 2015, photos by Sue Carnahan. (D) Hat Mountain, Sauceda Mts, 22 Mar 2014. (E) Alamo Canyon, 9 Sep 2013.

Widespread across the flora area but seldom on open desert flats; canyons, washes, arroyos, and rocky hills and mountains, often beneath spiny shrubs such as ironwoods (*Olneya*) and among rocks. A specimen 3500 years old was found in the Puerto Blanco Mountains.

Arizona to Texas and Florida, to Argentina and Bolivia, and the West Indies, adventive in the Old World and often weedy.

OP: Alamo Canyon, *Harbison 13 Dec 1939.* 10 mi S of Bates Well, 5 May 1940, *Benson 9905.* Dripping Springs, 16 Apr 1952, *Parker 7949.* Puerto Blanco Drive, 5.2 mi W of Visitor Center, 16 Oct 1977, *Bowers 889.* †Puerto Blanco Mts, on ridge, capsule, 3440 ybp.

CP: Agua Dulce Spring, 13 Apr 1964, *Niles 343.* Heart Tank (Simmons 1966). Christmas Pass, 13 Apr 1992, *Harlan 255.* Pinacate Lava, 15 Sep 1992, *Felger 92-770.*

Hermannia

Mostly in Africa, Arabia, and few in Australia and southwestern USA to Central America; 180 species.

Hermannia pauciflora S. Watson

Dwarf burstwort. Figure 12.

Small, straggly perennials with stellate hairs, the herbage drought deciduous. Stems herbaceous, often reddish, to 30 cm long, erect to trailing, dying back in drought to a knotty or semi-woody base. Herbage, calyx, and petal bases often reddish. Leaves petioled; blades triangular-lanceolate to ovate, 0.5–1+ cm long, the margins coarsely toothed. Flowers solitary from leaf axils; pedicelled. Petals bright yellow, 6–8 mm long. Stamens 5, united basally. Fruits of reddish brown, papery capsules, 1–1.5 cm long, ovoid, and bristly along 5 thin, toothed wings; seed many and kidney-shaped. Flowering non-seasonally with warm weather and sufficient soil moisture. (Description based on southern Arizona and Sonora specimens.)

Figure 12. *Hermannia pauciflora.* King Canyon, Tucson Mts, 21 Feb 2009, photos by Patrick Alexander.

Discovered in the Ajo Mountains by Beth Fallon in 2011, this record is the westernmost outpost for the species. The nearest known populations are in the Tucson and Waterman mountains. This small, rather inconspicuous plant is easily overlooked, especially when dormant.

Southern Arizona and Sonora southward to the Guaymas Region, and northern Mexico eastward to Tamaulipas. As of 2013, *H. pauciflora* was considered globally threatened by NatureServe, but in reality it is not rare or threatened.

OP: Foothills of Ajo Mts, near Arch Canyon with *Simmondsia chinensis*, rocky and bouldery, 2750 ft, west aspect, UTM 337421, 354659630, *Fallon 30 Mar 2011.*

Hibiscus

Perennials, suffrutescent or subshrubs (those in the flora area) with stellate hairs. Stipules awl-shaped to leaf-like, falling early. Epicalyx relatively large and conspicuous or highly reduced. Fruit a capsule of 5 persistent carpels, laterally fused, splitting dorsally; capsules at maturity spreading open, star-shaped. Seeds densely covered with long, silky hairs (those in the flora area). Worldwide; 350 species (although *Hibiscus* is paraphyletic).

1. Leaves broadly ovate to obovate and toothed, not lobed or parted; epicalyx inconspicuous, less than 0.5 cm long, shorter than the carpels; corollas white to pink, often with a maroon center. ..... **Hibiscus denudatus**

1. Adult leaves deeply 3-lobed or 3-parted; epicalyx conspicuous, the bracts more than 1 cm long, longer than the carpels; corollas yellow with a maroon center.

2. Stems with simple or 2- or 3-rayed hairs, these not appressed, and also with two vertical lines of small, recurved hairs extending down from the leaf bases..... **Hibiscus biseptus**

2. Stems with evenly distributed 4-armed hairs, the arms closely appressed to the stem. ..... **Hibiscus coulteri**

Hibiscus biseptus S. Watson
Arizona rose-mallow. Figure 13.

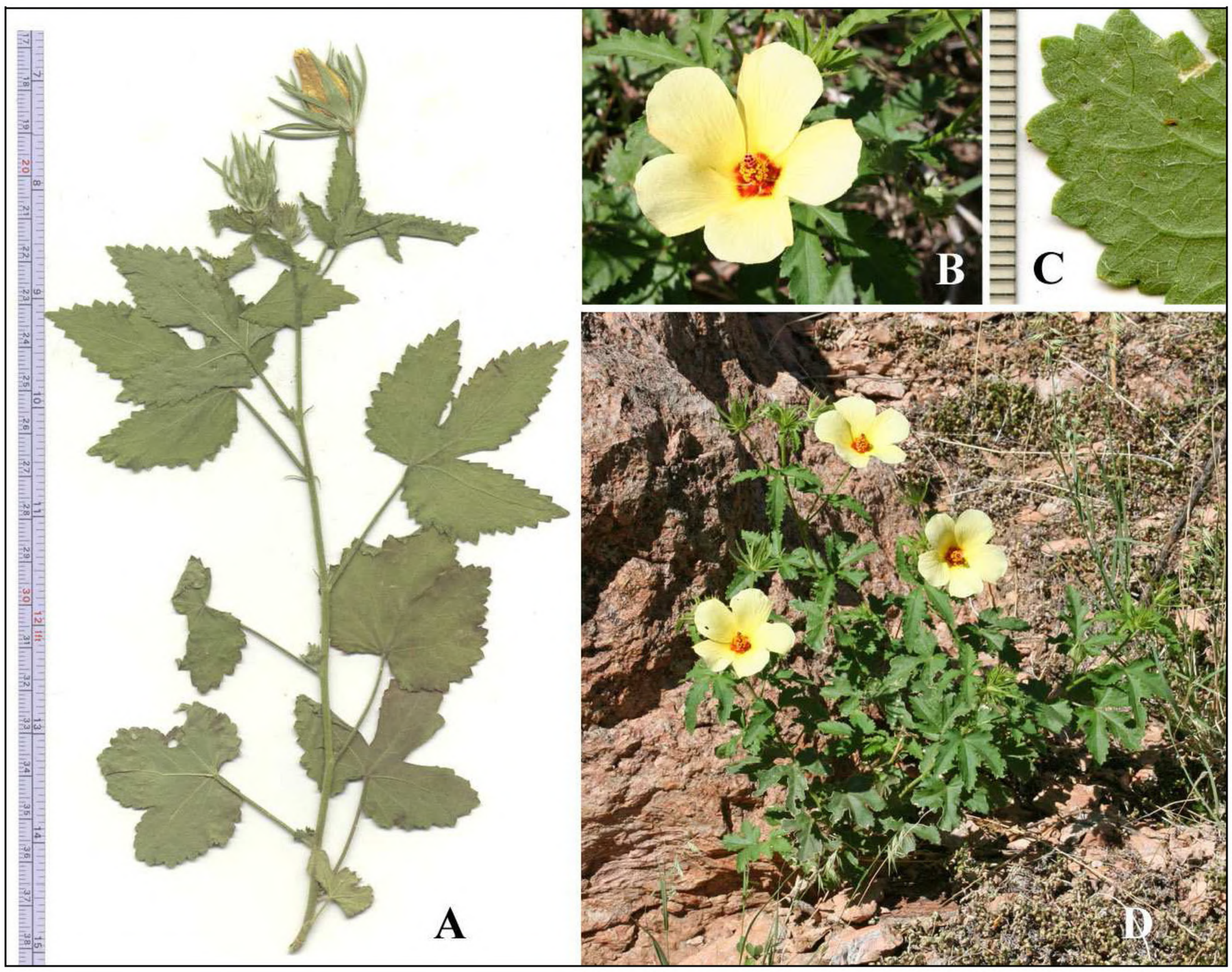

Figure 13. *Hibiscus biseptus.* Arch Canyon: (A) 13 Sep 2013; (B & D) 16 Sep 2006; (C) 26 Aug 2014.

Perennial herbs often forming few-branched, leafy plants. Stems with simple or 2- or 3-rayed hairs, these not adpressed, and two vertical lines of small, recurved hairs extending down from the leaf bases (stipules). Leaves deeply 3-parted, with slender segments more than twice as long as wide, with raggedly toothed margins; juvenile and new-growth leaves not as deeply parted. Corollas yellow, large and showy, with a red center, similar to those of *H. coulteri*; flowering during the warmer months with sufficient moisture.

Known from the Ajo Mountains, from the trails to the Arch and Bull Pasture, and Alamo Canyon.

Arizona and northwestern Mexico to Jalisco, and both Baja California states.

OP: Alamo Canyon, N fork, 700 m, 16 Oct 1987, *Baker 7557* (ASU; mixed collection with *H. coulteri*). Below the arch, Arch Canyon, 2880 ft, 12 Sep 2013, *Rutman 20130912-22.*

Hibiscus coulteri Harvey ex A. Gray
Desert rose-mallow. Figure 14.

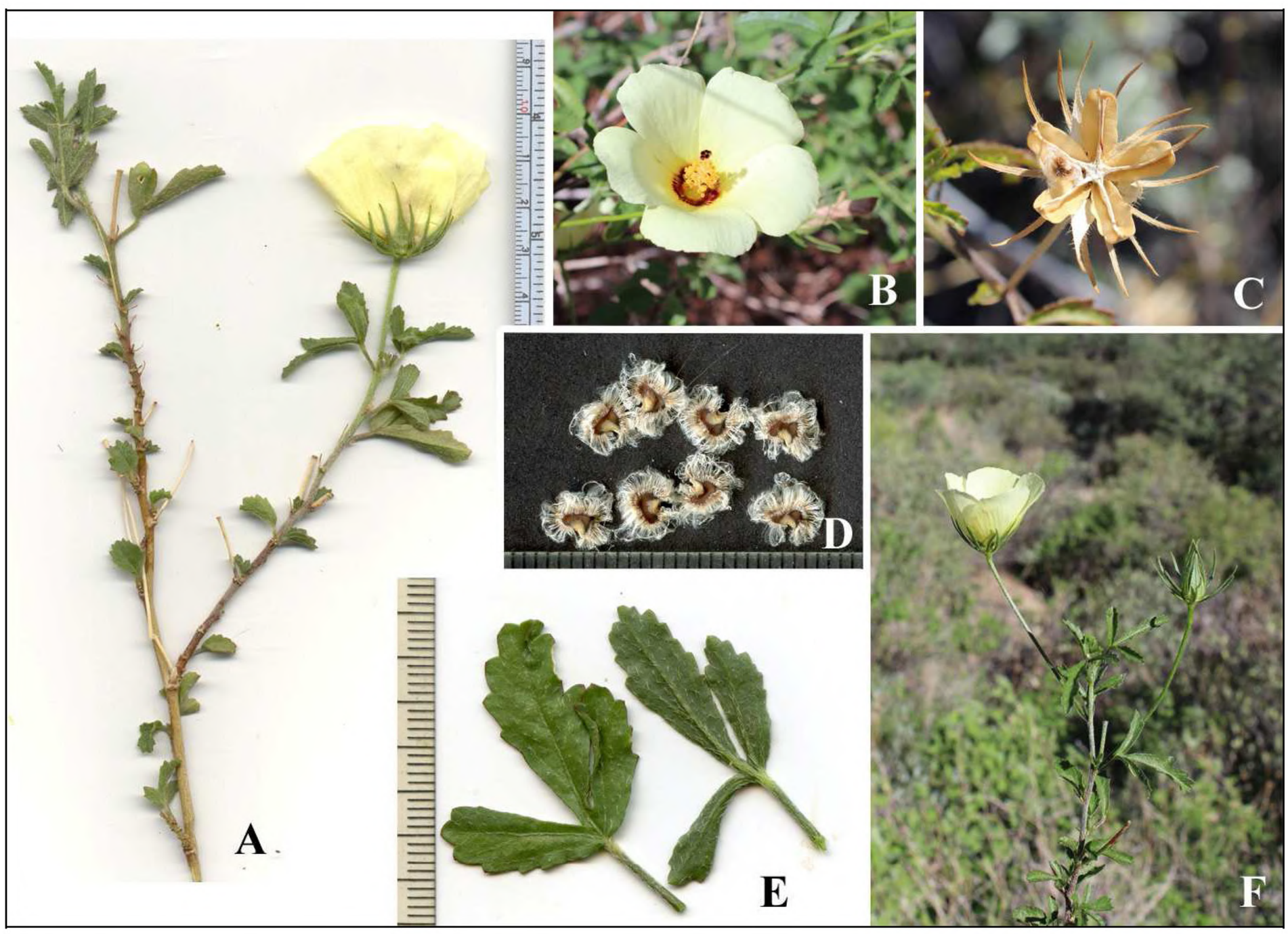

Figure 14. *Hibiscus coulteri.* Alamo Canyon: (A) 10 Sep 2008; (B) 7 Sep 2013. (C) Near Victoria Mine, 23 Dec 2013. (D) Seeds, Boulder Canyon, 30 Sep 2014. (E & F) Arch Canyon, 26 Aug 2014.

Subshrubs or herbaceous perennials, often forming few-branched, spindly plants to nearly 0.5 m tall. Stems slender and firm; densely pubescent with whitish, stellate hairs with 4 conspicuously adpressed arms, the hairs more or less evenly distributed around the stem. Leaves deeply 3-parted,

the segments more than twice as long as wide, with raggedly toothed margins; juvenile and new-growth leaves not as deeply parted. Floral bracts slender, rigid, and longer than the carpels. Flowers large and showy, often 5 cm wide; calyx 1.6–2 cm long, deeply divided into lanceolate lobes; corollas yellow with a maroon center, the petals mostly 2.5–3+ cm long; flowers opening after sunrise and closing at night; warmer months with sufficient moisture.

Rocky slopes and thin soils on the east side of Cabeza Prieta and across Organ Pipe. Usually growing within other plants, either because they escape grazing there or for support for the spindly stems.

Southern Arizona to southern Texas, and Sonora to Zacatecas, and Baja California.

OP: Alamo Canyon, 13 Dec 1939, *Harbison 26248.* Headquarters, *McDougall 10 Apr 1941.* Dripping Springs, 16 Apr 1952, *Parker 7947.* Bull Pasture Trail, 9 May 1979, *Bowers 1706.*

CP: Childs Mt, 9 Apr 1993, *Felger 93-286.*

Hibiscus denudatus Bentham

Rock hibiscus. Figure 15.

Multiple-stemmed perennial herbs or subshrubs, branched from the base, 0.3–1 m tall, dying back to a thickened woody base in extreme drought. Herbage pale yellow-green, densely pubescent with stellate hairs. Leaves petioled, (2) 2.5–4.5 cm long; leaf blades broadly ovate to oblong-ovate, rounded to obtuse at tip, the margins toothed; rainy-season leaves greener, thinner, and larger than dry-season leaves; leaves gradually drought deciduous. Floral bractlets usually appressed and inconspicuous, the longer ones 1–3 mm, the tips often breaking off early, and sometimes difficult to distinguish in color and texture from base of calyx. Calyx 10–16 mm long, deeply divided into lanceolate lobes. Corollas white to pinkish or pale lavender with maroon spots in the center, the petals often 2–2.7 cm long. Seeds covered with silky hairs 3–4 mm long. Flowering at various seasons with sufficient moisture, especially warmer months in spring.

Widespread and common across the flora area, mostly hills and mountains, arroyos and slopes. It has grown in Organ Pipe for at least 7600 years and in the Tinajas Altas region for at least 15,700 years.

Southeastern California to Baja California Sur and eastward to Texas and northern Mexico.

OP: Near Bonito Well, 9 Apr 1941, *McDougall 59.* Alamo Canyon (Mulroy 1971). Hills above Aguajita Spring, *Warren 10 Nov 1983.* Quitobaquito, *Beale 23 Feb 1986* (ORPI). †Puerto Blanco Mts, on ridge, leaves, 2160 & 7580 ybp.

CP: Tule Tank, *Vorhies 17 Apr 1924.* Hills E of Papago Well, 26 Mar 1932, *Shreve 5924.* O'Neill Hills, *Darrow 14 Apr 1941.* Sheep Mt, 18 Feb 1979, *McLaughlin 1940.*

TA: W end Cipriano Pass, 12 Feb 1977, *Reeves R5431* (ASU). Tinajas Altas, ridge above tanks, 1420 ft, 26 Nov 2004, *Felger 04-91.* †Butler Mts, stems, leaf fragments, 740 & 8570 ybp. †Tinajas Altas, leaf fragments, seeds, 5860 to 15,680 ybp (5 samples).

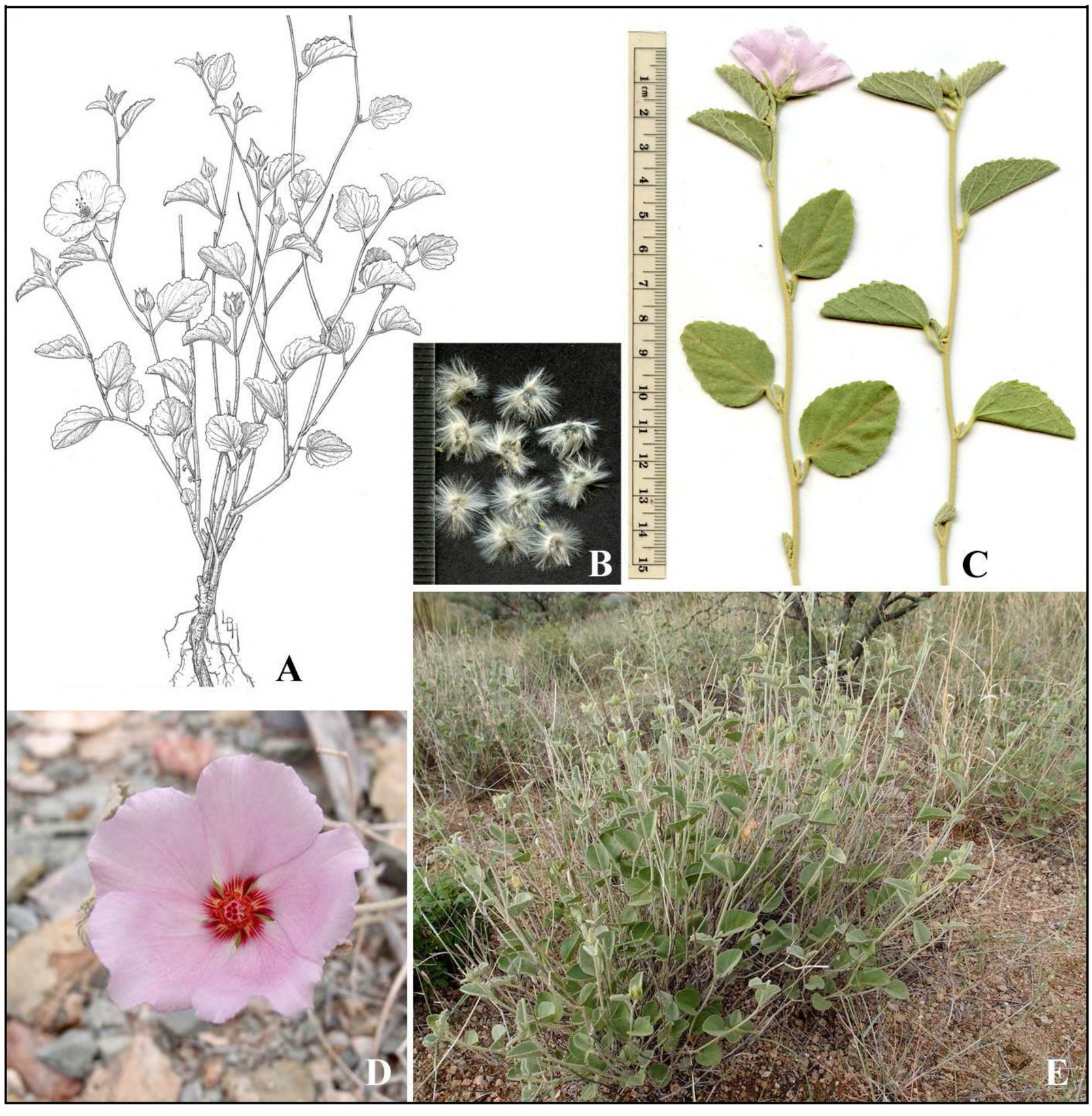

Figure 15. *Hibiscus denudatus*. (A) By Lucretia Breazeale Hamilton. (B) Boulder Canyon, 30 Sep 2014. (C) Teddy Bear Pass, Ajo Mountain Drive, 30 Sep 2014. (D) Waterman Mts, Ironwood Forest National Monument, 23 Feb 2014. (E) Salero Ranch, Santa Cruz Co., 21 Aug 2013. Photos D & E by Sue Carnahan.

Horsfordia – Velvet mallow

Tall spindly shrubs; densely stellate pubescent. Pedicels jointed but sometimes obscurely so, the joint best developed at fruiting time. Epicalyx absent. Fruit a schizocarp, the mericarps separating at maturity, 1–3-seeded, the lower chamber indehiscent with firm, wrinkled walls and a single tightly held seed, the upper chamber dehiscent, splitting into expanded membranous wings. One or both species in the flora area has been in Organ Pipe for more than 5200 years.

Southwestern USA and northwestern Mexico; 4 species.

1. Petals pinkish or sometimes nearly white when fresh, drying bluish to pale lavender; larger leaves mostly broadly ovate and cordate (heart-shaped); mericarps 1-seeded..... **Horsfordia alata**
1. Petals orange when fresh; larger leaves mostly lanceolate and not cordate at base; mericarps 2 or 3-seeded..... **Horsfordia newberryi**

Horsfordia alata (S. Watson) A. Gray
Pink velvet-mallow. Figure 16.

Sparsely branched slender shrubs often 2–3.5 m tall; often grayish pubescent; branches often at nearly right angles to the main stem. Leaves velvety, larger ones 6–10+ cm long, the petioles prominent, the blades usually broadly ovate, cordate at the base, often relatively thick, but new-growth summer-fall leaves often thin and scarcely or not at all cordate (uppermost leaves of flowering branches often lanceolate). Petals 14–18+ mm long, white to pale pink or pale lavender, drying bluish to pale lavender. Filaments, anthers, and style white, or free portion of filaments pale lavender; stigma often dark reddish purple. Fruits 10–15 mm wide. Mericarps 1-seeded, the upper chamber forming ovules but these aborting. Reproductive at various seasons.

Mountains and hills, and often along larger washes and arroyos, and sometimes along small washes; rocky to sandy-gravelly soils. Common in the Tinajas Altas Mountains and western half of Cabeza Prieta, less common eastward to the southwestern part of Organ Pipe.

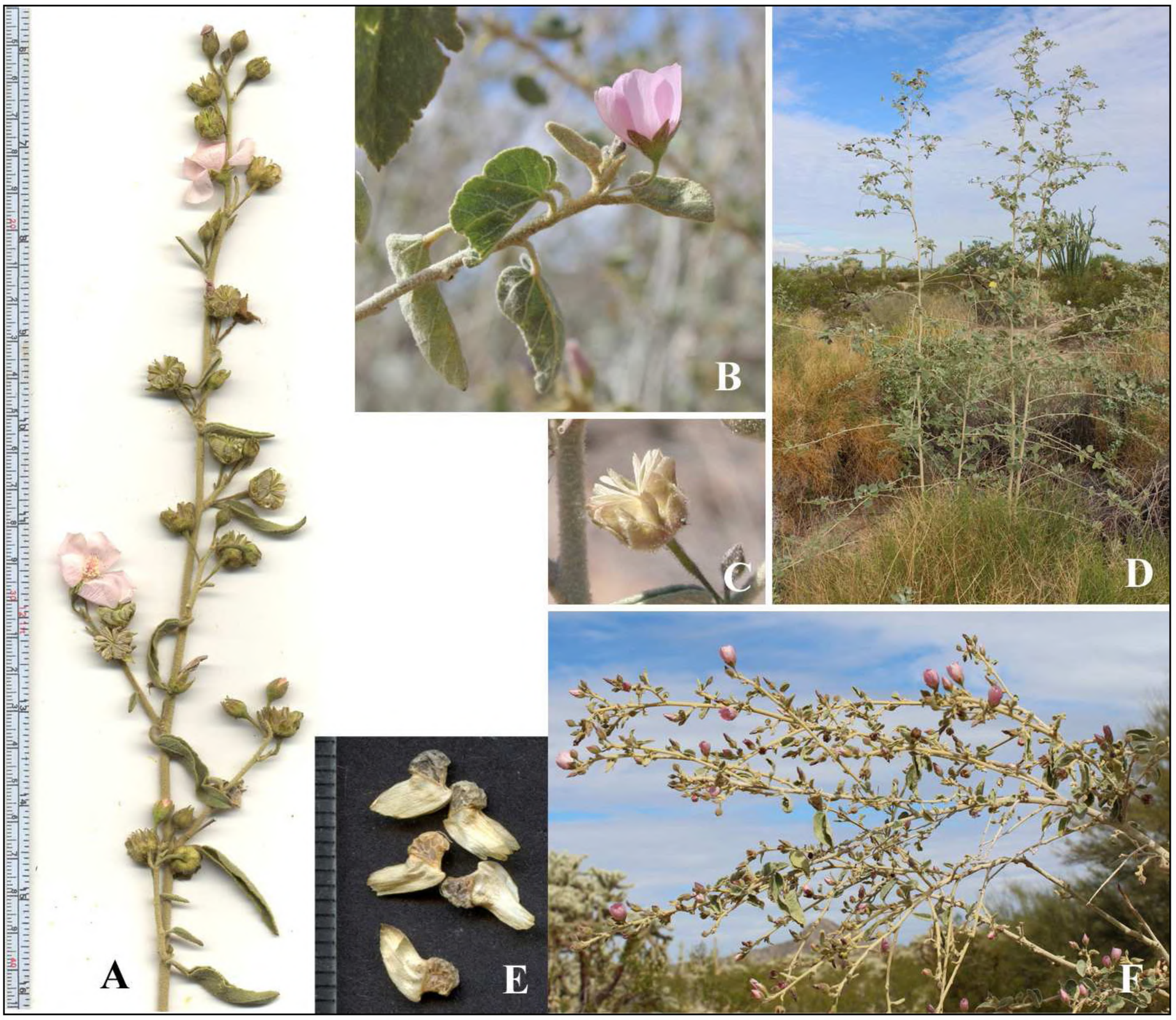

Figure 16. *Horsfordia alata*. Mex Hwy 8, 11 km SW of Sonoyta, between the Sierra Cubabi and Sierra Los Tanques, Sonora: (A) 28 Mar 2013; (C) 7 Mar 2009; (D) 7 Sep 2014; (E) 18 Mar 2015. (B & F) W slope of Sierra Cubabi, Sonora, 6 Feb 2014.

Southwestern Arizona, northwestern Sonora, southeastern California, and both Baja California states. This is one of the tallest mallows in the deserts of western North America and is found in very arid regions.

OP: 3 mi W of Quitobaquito, 13 Nov 1978, *Bowers 1526*. Corner Well, 3 Dec 1990, *Felger 90-579*.
CP: Tule Tank, 26 Apr 1932, *Shreve 5932*. Pinacate Plateau, *Goodding 13 Feb 1942*. Heart Tank, 14 Apr 1964, *Niles 350*. Buckhorn Tank, 14 Jun 1992, *Felger* (observation).
TA: Tinajas Altas, 17 Apr 1948, *Kurtz 1158*. Camino del Diablo, E of Raven Butte, 10 Jan 2002, *Felger* (observation).

Horsfordia newberryi (S. Watson) A. Gray
Orange velvet-mallow. Figure 17.

Slender shrubs, usually several times taller than wide and few-branched, to 2.5+ m tall, often considerably shorter; often yellowish pubescent. Leaves velvety, larger ones 5.5–10 (15) cm long, the petioles prominent, the blades often rather thick, lanceolate, not cordate at base or scarcely so in some larger leaves. Petals bright yellow-orange, 7–8+ mm long. Fruits 8–15 mm wide. Lower mericarp chamber 1-seeded, the upper chamber 1- or 2-seeded. Reproductive at various seasons, except during coldest and driest weather.

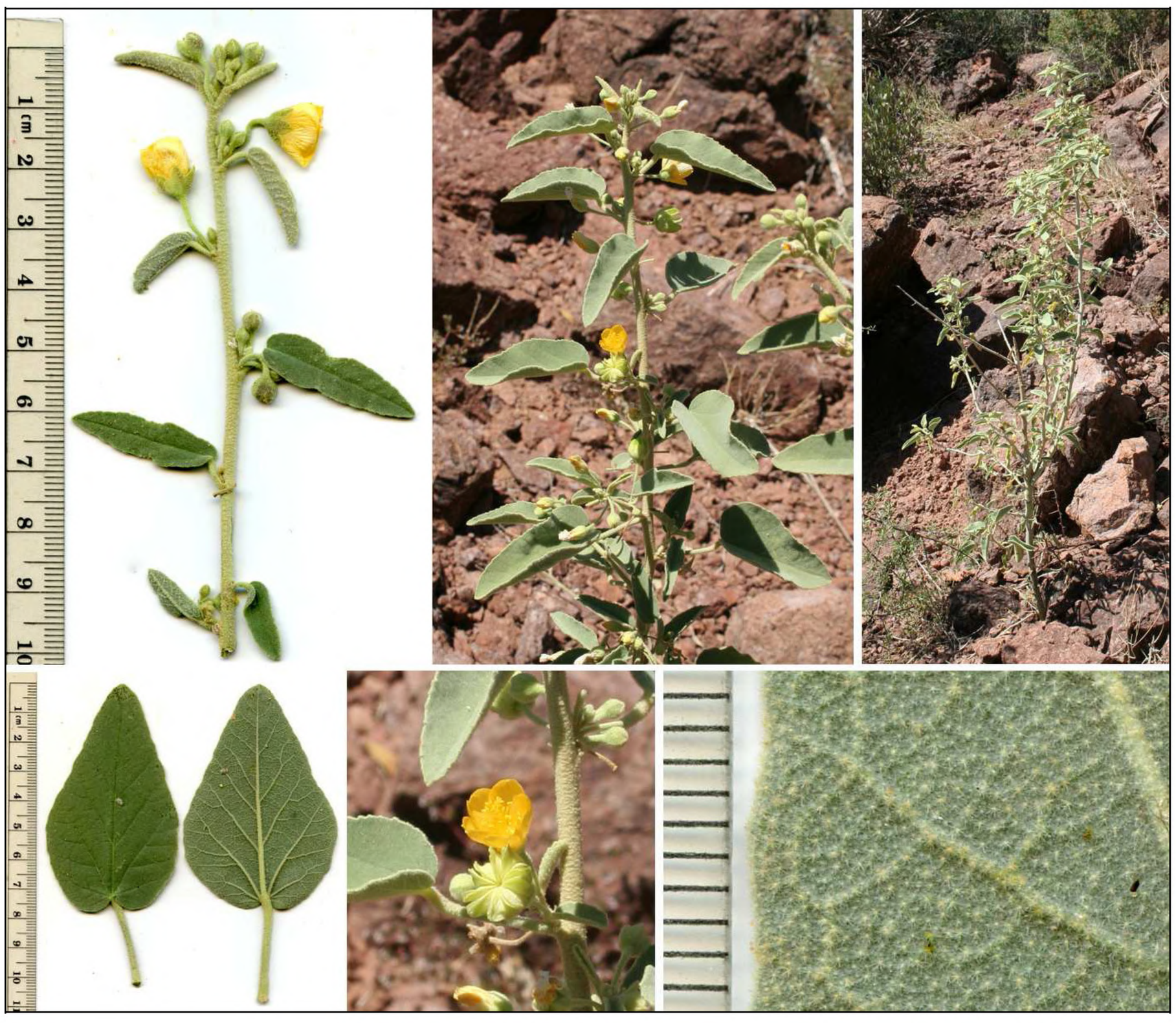

Figure 17. *Horsfordia newberryi*. SE-facing slope of the Sierra Blanca, Pinacate Biosphere Reserve, Sonora, 18 Feb 2015.

Rocky slopes on hills and mountains, sometimes to their summits, and especially on arroyo and canyon sides; through most of the flora area.

Southwestern Arizona, northwestern Sonora, southeastern California, and both Baja California states.

OP: Pitahaya Canyon, *Nichol 23 Feb 1939.* Quitobaquito, 18 Mar 1945, *Darrow 2411.* Santa Rosa Mts, *Rutman 29 Aug 2001* (ORPI).

CP: Tule Tank, 6 Apr 1979, *Lehto 23549* (ASU). Canyon at Agua Dulce Tank, 13 Jun 1992, *Felger 92-571.* Cabeza Prieta Peak, S. facing side of summit, 2550 ft, 24 Mar 1995, *Yeatts 3661* (CAB). Heart Tank, 14 &15 Jun 1992, *Felger* (observation).

TA: Borrego Canyon, 16 Jun 1992, *Felger* (observation). Fortuna Mine, along Camino del Diablo, *Halse 31 Mar 1973.*

Horsfordia sp./spp.

OP: †Puerto Blanco Mts, on ridge, leaf fragments, mericarps, modern (30) to 5240 ybp (8 samples).

***Malva**

Annual and perennial herbs. Native to the Old World (*Malva* sensu stricto) and North America by inclusion of some *Lavatera* (Hill 2015): 30+ species.

***Malva parviflora** Linnaeus

Cheeseweed; *malva, quesitos*; tas ha:hag, ha:hag cu'igkam. Figure 18.

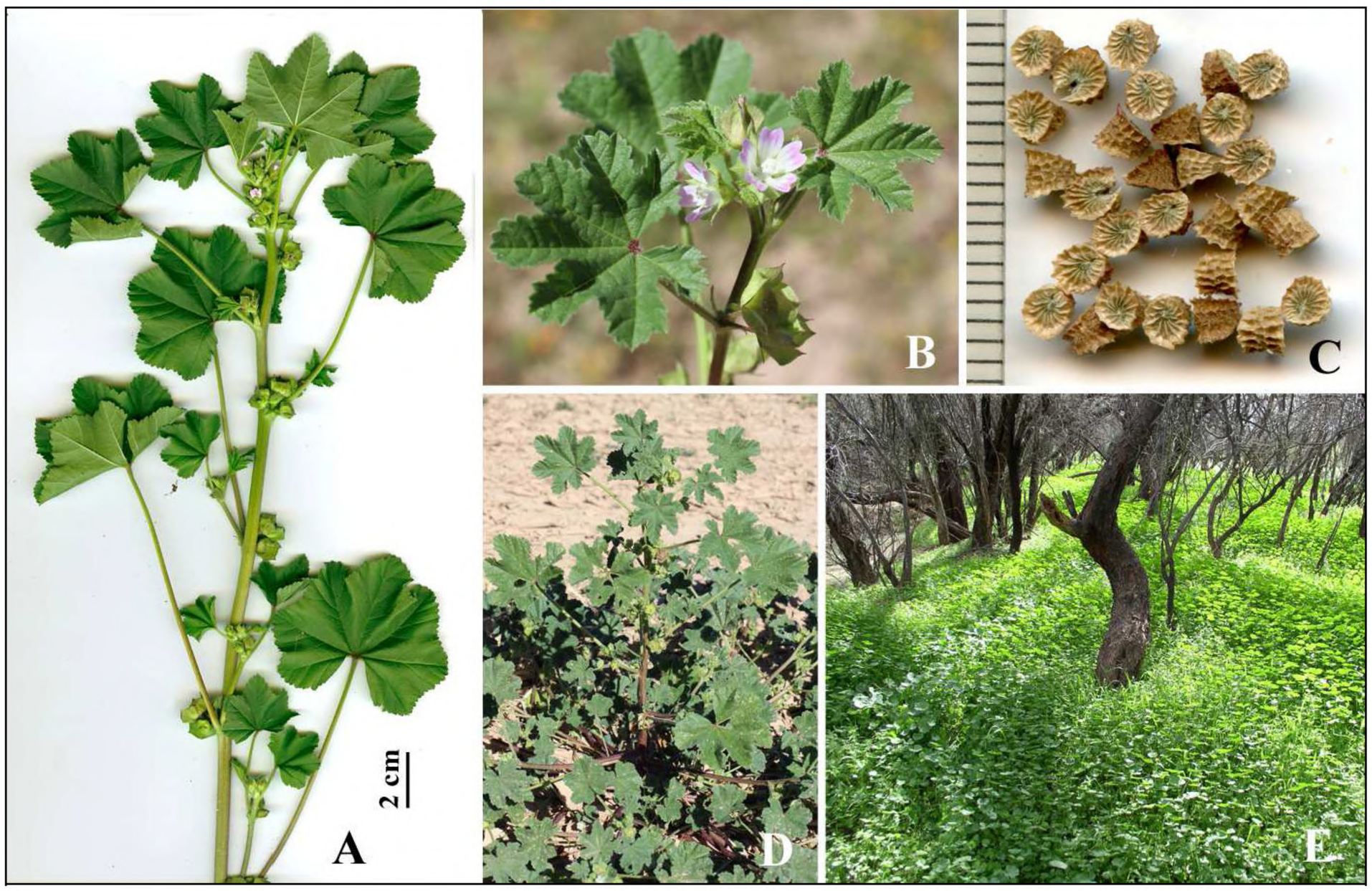

Figure 18. *Malva parviflora.* (A) Ajo, 13 Feb 2005. Pinacate Junction, Pinacate Biosphere Reserve, Sonora: (B & C) 7 Mar 2015; (D) 5 Mar 2015. (E) Hot Shot Tank, NE of Ajo, 6 Feb 2005.

Winter-spring ephemerals with a well-developed taproot; glabrate to moderately pubescent with soft, mostly stellate white hairs. Petioles longer than the blades, the blades nearly orbicular to kidney-shaped, usually palmately 5- or 7-lobed. Flowers 1 to several in leaf axils; epicalyx of slender bractlets. Petals 5 mm long, white with a pale pink-lavender tinge, obovate, and notched at the tip. Fruit a schizocarp, depressed-globose, 6–7 mm wide; mericarps about 10, in a torus-shaped ring, 1-seeded, indehiscent, dispersing individually at maturity.

Organ Pipe in localized, disturbed habitats. It is a common urban and agricultural weed in nearby Sonora, a potential source of immigration.

Native to Eurasia and naturalized around the world.

This weedy plant is cooked as greens in many parts of the world, and the fruits are also edible (Bean & Saubel 1972; Kirk 1970; Yanovsky 1936). Russell's (1908) report of this species as a Pima emergency food was based on misidentification of *Eremalche exilis* (Rea 1997).

OP: Quitobaquito, 14 Apr 1963, *Felger 7663*. Abundant weed near old corral in Alamo Canyon, 16 Feb 1979, *Bowers 1563*.

Malvastrum

Annual and perennial herbs and small shrubs. Americas; 15 species.

Malvastrum bicuspidatum (S. Watson) Rose subsp. **bicuspidatum**
[*M. tricuspidatum* var. *bicuspidatum* S. Watson]. Figure 19.

Figure 19. *Malvastrum bicuspidatum* subsp. *bicuspidatum*. (A & B) Bull Pasture Trail, 24 Sep 2006. (C & D) Alamo Canyon, 3 Sep 2014.

Small shrubs or subshrubs with slender, firm stems. Herbage stellate-pubescent. Leaves 2–6 cm long, petioled, the blades ovate, the margins serrate. Epicalyx of 3 lanceolate bracts. Calyx 5-

lobed, 6–8 mm long. Petals, stamens, and styles pale yellow-orange. Petals 6–8 mm long. Fruits schizocarps, 6–7 mm wide, globose-depressed, flattened at each end (oblate). Mericarps 9–12, indehiscent, horseshoe-shaped, the lateral walls ribbed, with 2 dorsal cusps, and 1-seeded. Seeds glabrous.

Ajo and Diablo mountains, especially at higher elevations, in canyons and on rocky slopes.

This subspecies occurs eastward and northward in south-central Arizona and in northwestern Mexico including Baja California Sur, Chihuahua, Durango, Sinaloa, and Sonora but is generally absent from the desert in western Sonora. Three other subspecies occur farther south in Mexico.

OP: Ajo Mts, *Goodding 21 Nov 1934*. Alamo Canyon, 13 Sep 1941, *Goodding 300-41*. W side of Montezuma's Head, *Van Devender 10 Mar 1978*. Arch Canyon, 2 Dec 1990, *Felger 90-553*. Diablo Mts, 807 m, shaded base of N-facing cliff, 22 Sep 2013, *Rutman 20130922-27*.

Malvella

Small, scurfy and herbaceous perennials from deeply seated roots, and spreading by rhizomes; growing and reproductive with sufficient soil moisture during warmer months. Herbage gray or silvery with appressed stellate hairs or peltate and often ciliate (fringed) scales. (In these lepidote scales, the basal portions of the radii are webbed like an umbrella with protruding ribs.) Leaves petioled; base of leaf blades conspicuously asymmetric. Epicalyx of 1–3 bractlets, quickly deciduous or absent. Petals white or pink, with stellate hairs on portions exposed in bud. Fruit a schizocarp, globose-depressed, flattened at each end, the mericarps indehiscent and 1-seeded.

Southwestern USA and Mexico with 3 species and one in the Mediterranean region.

1. Plants with mostly stellate hairs and some peltate scales; leaf blades nearly as wide to wider than long..... **Malvella leprosa**
1. Plants with silvery, peltate scales; leaf blades narrowly triangular, conspicuously longer than broad. ..... **Malvella sagittifolia**

Malvella leprosa (Ortega) Krapovickas
[*Sida leprosa* (Ortega) K. Schumann. *Malva hederacea* Douglas. *S. leprosa* var. *hederacea* (Douglas) K. Schumann ex Clement].
Alkali mallow. Figure 20.

Perennials often propagating from branching rhizomes. Stems, leaves, and calyces densely covered with stellate hairs, and calyces, upper surfaces of leaf blades, and often the stems also with peltate scales. Stems 6–30 cm long, erect, or becoming spreading and decumbent; larger stems 1.3–2 mm diameter. Leaf blades broadly ovate, about ⅔ as wide as long to orbicular and broader than long (nearly kidney-shaped) or asymmetrically triangular-ovate, 1.6–4 × 2–5 cm, the margins toothed. Epicalyx of linear bractlets, shorter than the calyx, sometimes seen on buds or flowers, usually difficult to see and very quickly deciduous. Calyx 8–11 mm long, the lobes broadly ovate, acute at tip. Petals pink, 1.5–1.8 cm long. Fruits red-brown, 6–7 mm in diameter.

Locally common in seasonally wet, hard-packed silty-clay soils of the large playas of Cabeza Prieta near the Mexico border.

Washington and Idaho to central Mexico, and in South America; introduced elsewhere, including Australia. It is considered a noxious weed in Arizona and California.

CP: Las Playas: 11 Apr 1978, *Reeves 6811* (ASU); 28 Nov 2001, *Felger 01-563*.

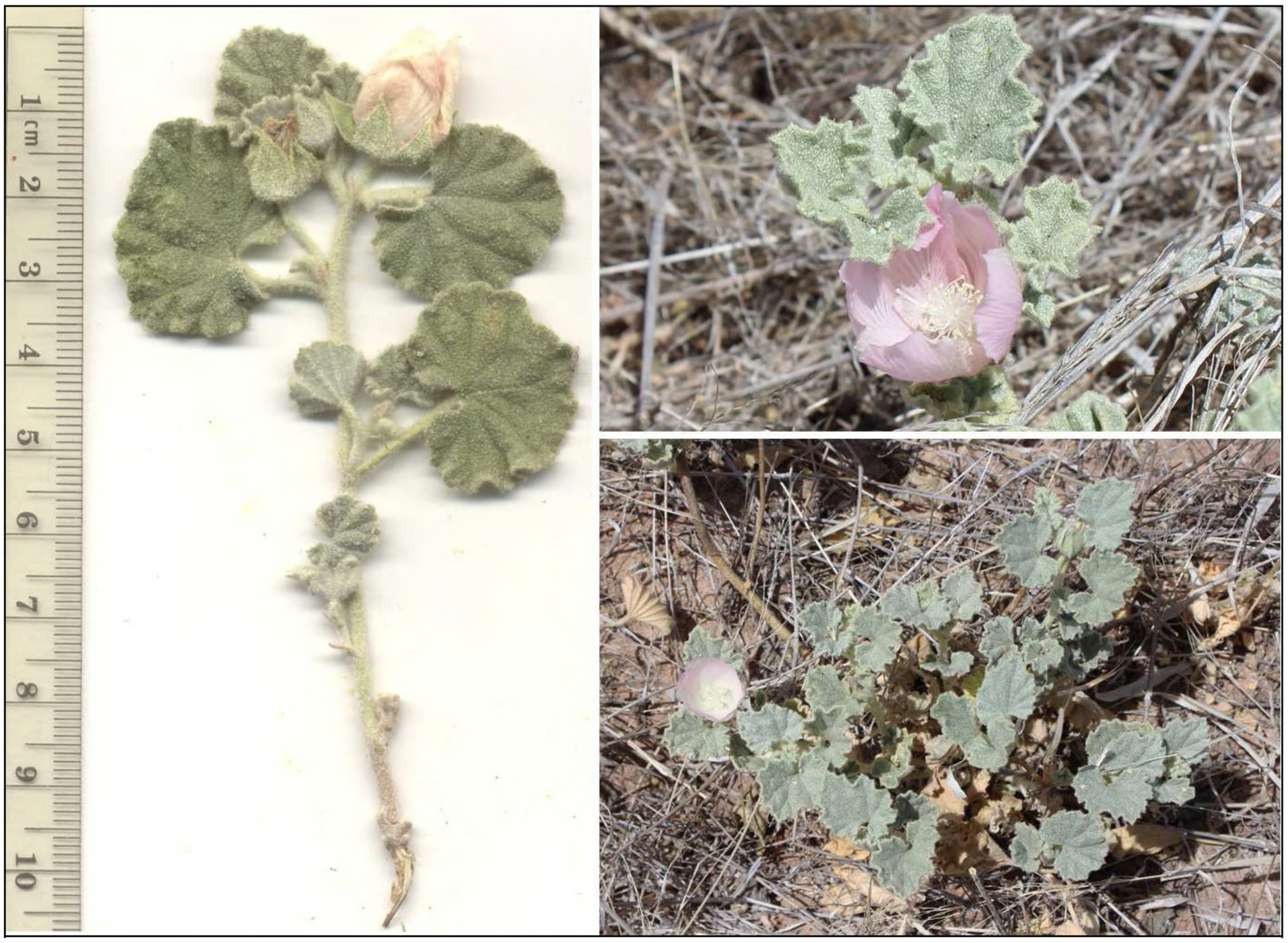

Figure 20. *Malvella leprosa*. Playa NNW of Ortega Represo (S of Las Playas), Sonora, 11 Apr 2014.

Malvella sagittifolia (A. Gray) Fryxell
[*Sida lepidota* A. Gray var. *sagittifolia* A. Gray]
Arrowleaf alkali mallow. Figure 21.

Perennials from a relatively deep, somewhat thickened taproot; propagating from branching rhizomes. Stems, leaves, and calyx dotted with silvery peltate scales, the margins erose-dentate (fringe-toothed). Stems slender, spreading and becoming nearly prostrate, 4–30 cm long. Leaf blades triangular, much longer than broad, 1.5–4.5 × 0.5–1.5 cm, with sagittate ("eared") basal lobes, the tip acute, the margin otherwise entire to few- or minutely toothed. Epicalyx absent, or sometimes vestigial and quickly deciduous below young buds. Petals mostly white, 1–1.3 cm long, lower (outer) surface of each petal with a pink pie-shaped wedge dotted with stellate hairs where the corolla is exposed in bud. Stamens and styles white, the stigmas rounded, dot-like, and bright red. Fruits 5–6 mm in diameter. Reproducing during warmer months. The plants are generally more delicate with more slender stems and leaves than *M. leprosa*.

Abundant in seasonally wet, hard-packed silty soils of playas at the southern margin of Cabeza Prieta.

Southern Colorado to Arizona, Sonora, western Texas, Coahuila and Durango.

CP: Pinta Playa, *Simmons 4 Oct 1964*. Las Playas, 28 Nov 2001, *Felger 01-564*. Dos Playas, 7 Apr 1979, *Lehto 23595* (ASU).

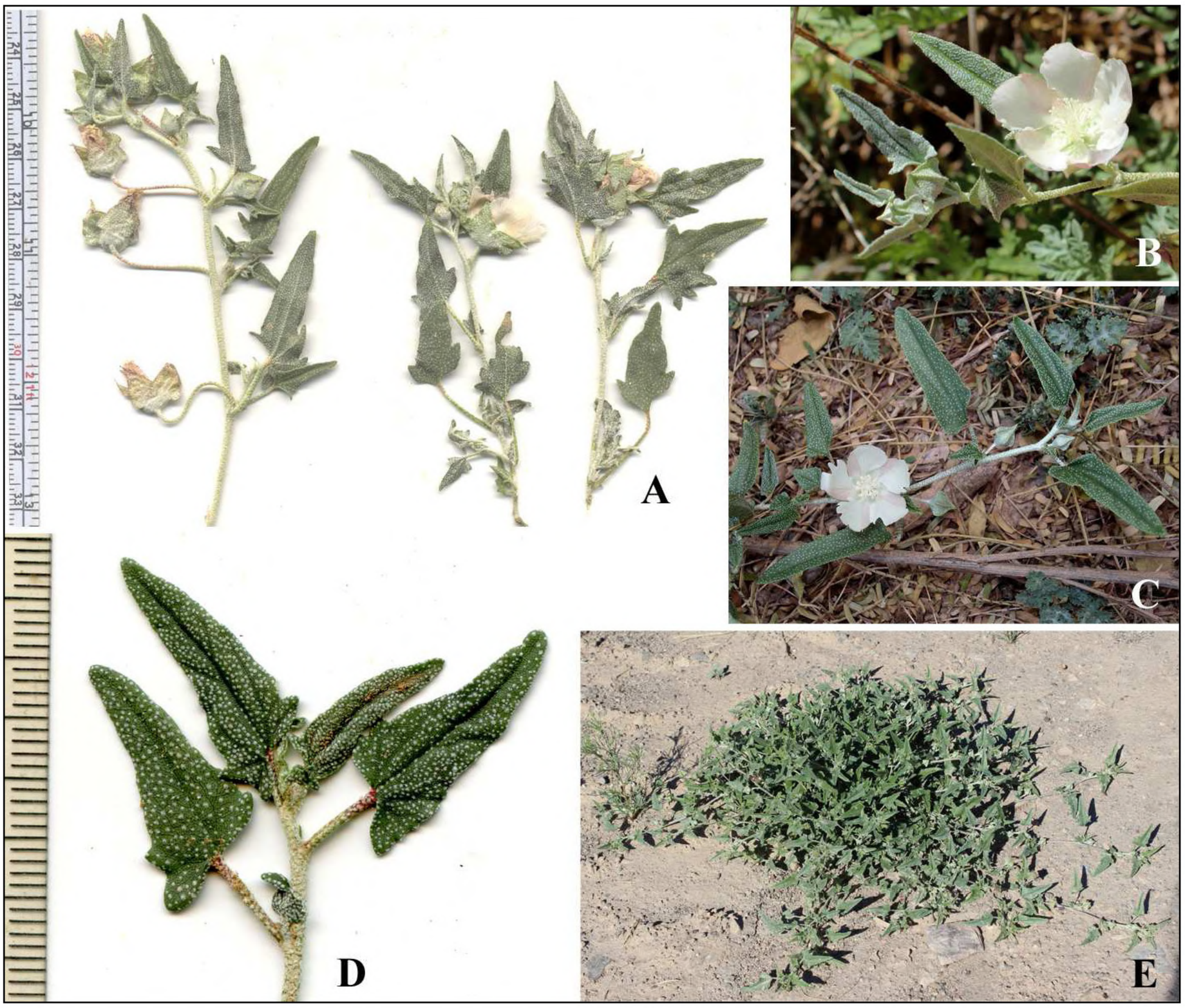

Figure 21. *Malvella sagittifolia.* Small playa SE of Pinacate Junction, Pinacate Biosphere Reserve, Sonora: (A) 17 Mar 2014; (D) 7 Mar 2015; (E) 5 Mar 2014. (B) Ortega Represo (S of Las Playas), 11 Apr 2014. (C) Cerro Proveedora, seasonally flooded, trail along cattle pasture, Rancho Puerto Blanco, Caborca, Sonora, 1 Mar 2015, photo by Sue Carnahan (SEINet).

Rhynchosida

Two species including *R. kearneyi* in Bolivia

Rhynchosida physocalyx (A. Gray) Fryxell
[*Sida physocalyx* A. Gray]. Figure 22.

Perennial herbs from a single, thick carrot-shaped root, the stems ascending to trailing, with scattered coarse stellate hairs. Growing and reproductive during warmer months with sufficient soil moisture. Leaves 2–5 cm long, the blades mostly lanceolate to broadly ovate or oval, with toothed and ciliate margins. Flowers solitary in leaf axils. Epicalyx absent. Calyx deeply 5-lobed, the lobes overlapping, cordate, conspicuously angled, and enlarging to become inflated and enclosing the fruit. Petals pale yellow, 5–8 mm long, the anthers orange and conspicuous. Fruit a schizocarp, 8–9 mm wide, globose depressed and flattened at each end, blackish and glabrous. Mericarps hard and indehiscent, the sides reticulate-veined, with a single seed.

Valley of the Ajo, usually as an understory plant in xeroriparian washes. Apparently rare, uncommon, or overlooked in the flora area, where it is at its farthest intrusion into the desert.

Eastward in southern and central Arizona to Texas and Oklahoma, southward in Mexico to Puebla, and disjunct in South America.

OP: Cherioni Wash, *Warren 10 Nov 1983*. E branch of Cuerda de Leña Wash at N boundary of Monument, *Rutman 20 Aug 2001* (ORPI).

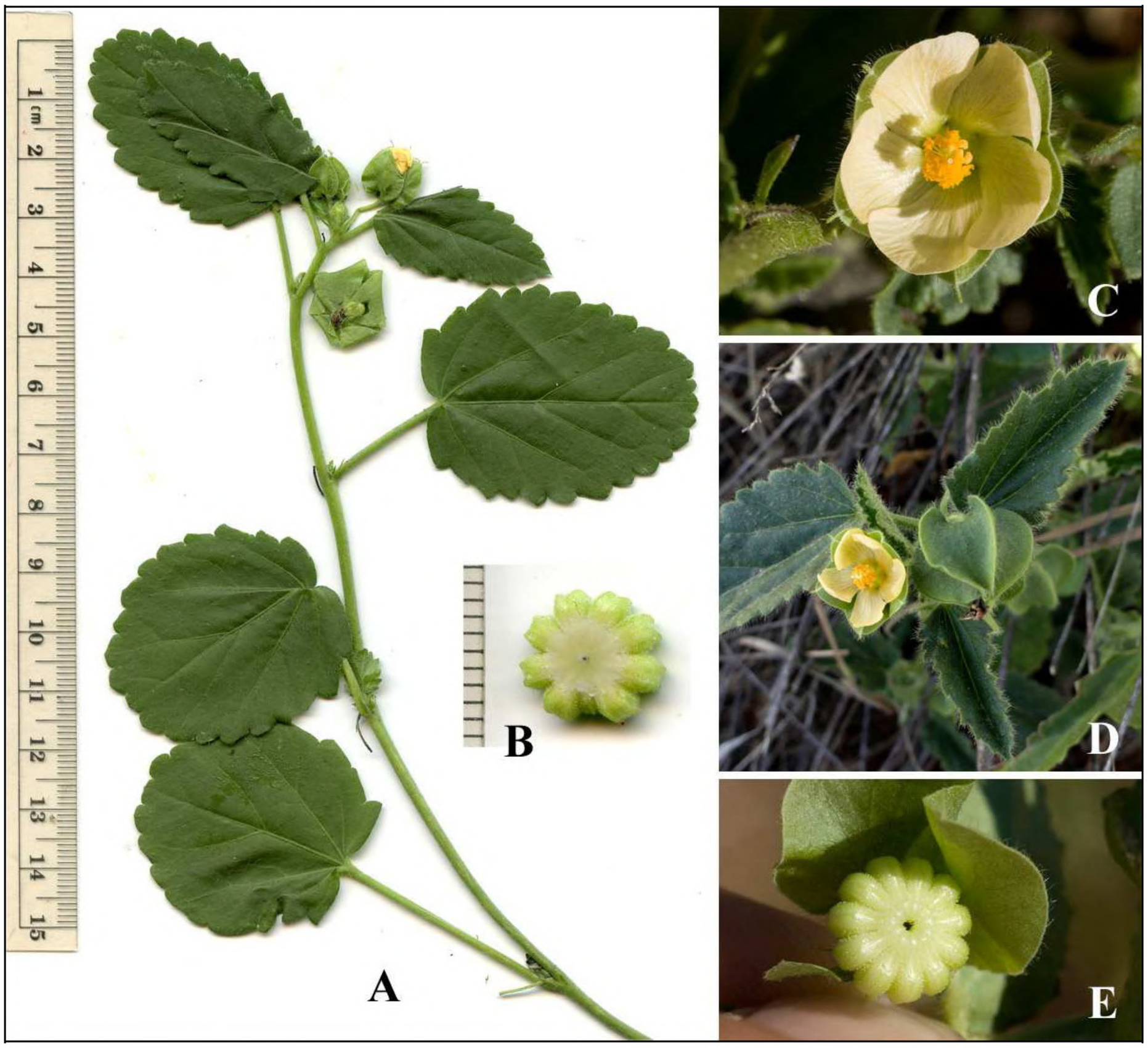

Figure 22. *Rhynchosida physocalyx*. (A & B) 8th Street and Campbell Ave, Tucson, 28 Sep 2014. (C & E) Sierra Vista Trail, W side of Organ Mts, Doña Ana Co., NM, 28 Sep 2008, photos by Patrick Alexander (SEINet). (D) Quail Springs Ranch, SW of Cottonwood, Yavapai Co., 28 Apr 2013, photo by David C. Thornburg (SEINet).

Sida

Annual and perennial herbs and shrubs. Nearly worldwide, but not in Europe, 150 species.

Sida abutifolia Miller

[*Sida filicaulis* Torrey & A. Gray. *S. procumbens* Swartz]. Figure 23.

Small annuals/ephemerals or mostly weakly perennial herbs, generally low-growing with slender and often procumbent stems. Herbage and calyces densely pubescent with short, stellate hairs, and also with simple, spreading hairs except on the leaf blades. Larger leaves often 1.5–5 (6)

cm long; petioles one-half to as long or longer than the blades. Leaf blades ovate to oblong, generally more than twice as long as wide, or sometimes linear-ovate to linear-elliptic on vigorous new growth, usually cordate at base, the margins crenate-toothed. Epicalyx absent. Flowers solitary in leaf axils on slender pedicels; calyx 4–5 mm long, the lobes ovate with an acuminate tip; petals 5–6 mm long, broadly obovate and shallowly notched at tip, pale yellow to pale yellow-orange, darker yellow basally like the anthers and stigmas giving a darker yellow center to the flower. Fruit a schizocarp, conical and flattened at each end, 4–5 mm wide. Mericarps 5, usually with 2 short, apical spines, 1-seeded. Seeds glabrous. Probably flowering all year except the coldest months and during extreme drought, but especially with summer rains. The flowers open during the afternoon.

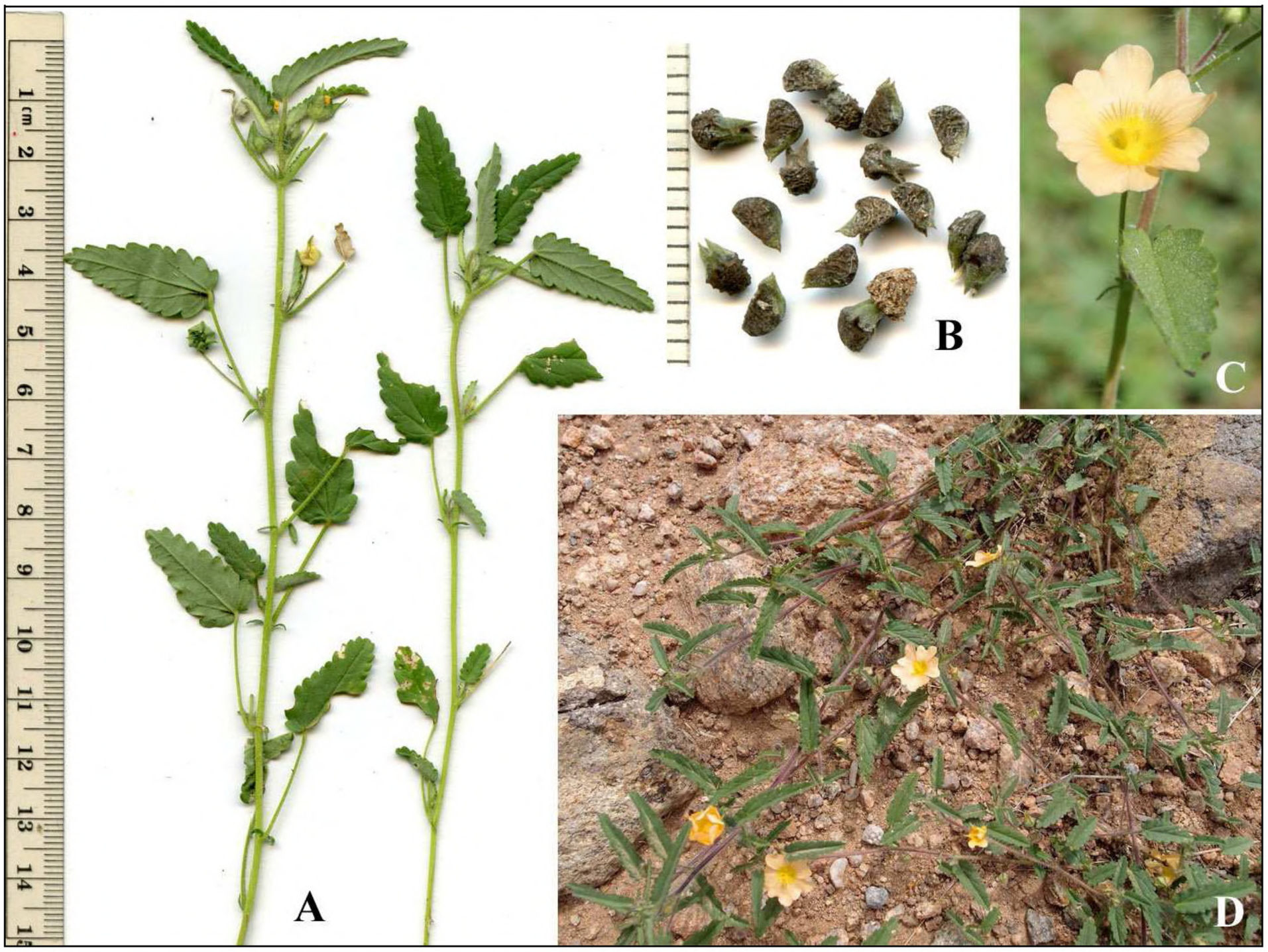

Figure 23. *Sida abutifolia*. Hwy 85, roadside ditch near mile 62: (A) 1 Aug 2014; (C) 14 Sep 2006. (B) Foothills of Diablo Mts, 30 Sep 2014. (D) Salero Ranch, Santa Cruz Co., 1 Aug 2013, photo by Sue Carnahan.

Ajo and Diablo mountains, especially at higher elevations and one unusual record at the Visitor Center.

Eastward in southern Arizona; southern USA to northern South America and West Indies.

OP: Saddle between Boulder and Arch Canyon, 3800 ft, 3 May 1978, *Bowers 1287* (ORPI). Visitor Center flower bed, *Beale 25 Mar 1988* (ORPI). Alamo Canyon, 29 Mar 2003, *Felger 03-423*. Trail from The Cones to Mount Ajo, 4090 ft, 10 Apr 2005, *Felger 05-294*. Arch Canyon, shaded slope N of the arch, 12 Sep 2014, *Rutman 20140912-4*. Diablo Mts, W of Boulder Canyon near N end of Ajo Mountain Drive, 30 Sep 2014, *Rutman*, scan

Sphaeralcea – Globe mallow; *mal de ojo*

Ephemerals and perennial herbs to shrubs (usually flowering in the first season or year), with stellate hairs. Leaves petiolate. Epicalyx of 3 filiform bracts. Petals of various colors. Fruit a schizocarp, the mericarps 1–3-seeded, with a ventral notch; each mericarp differentiated into (1) an upper, dehiscent section with smooth carpel walls and spreading apart at maturity, the seed(s), if present, falling away early, and (2) a lower, indehiscent section, the body of the mericarp with a reticulate surface and retaining the seed(s): thus 2 strategies for seed dispersal (Figures 24 & 25). Seeds kidney-shaped. Globe mallows have been part of the regional flora for more than 11,300 years.

Americas, mostly in arid regions; 50 species (La Duke 2015).

Sphaeralcea plants are self-incompatible but with an open breeding system capable of producing hybrids between numerous species (Dreher 2014). Taxonomy of *Sphaeralcea* can be difficult, due to many intermediate forms. For example, if enough specimens are at hand, *S. ambigua*, *S. angustifolia*, and *S. emoryi* can be seen to form a seamless continuum.

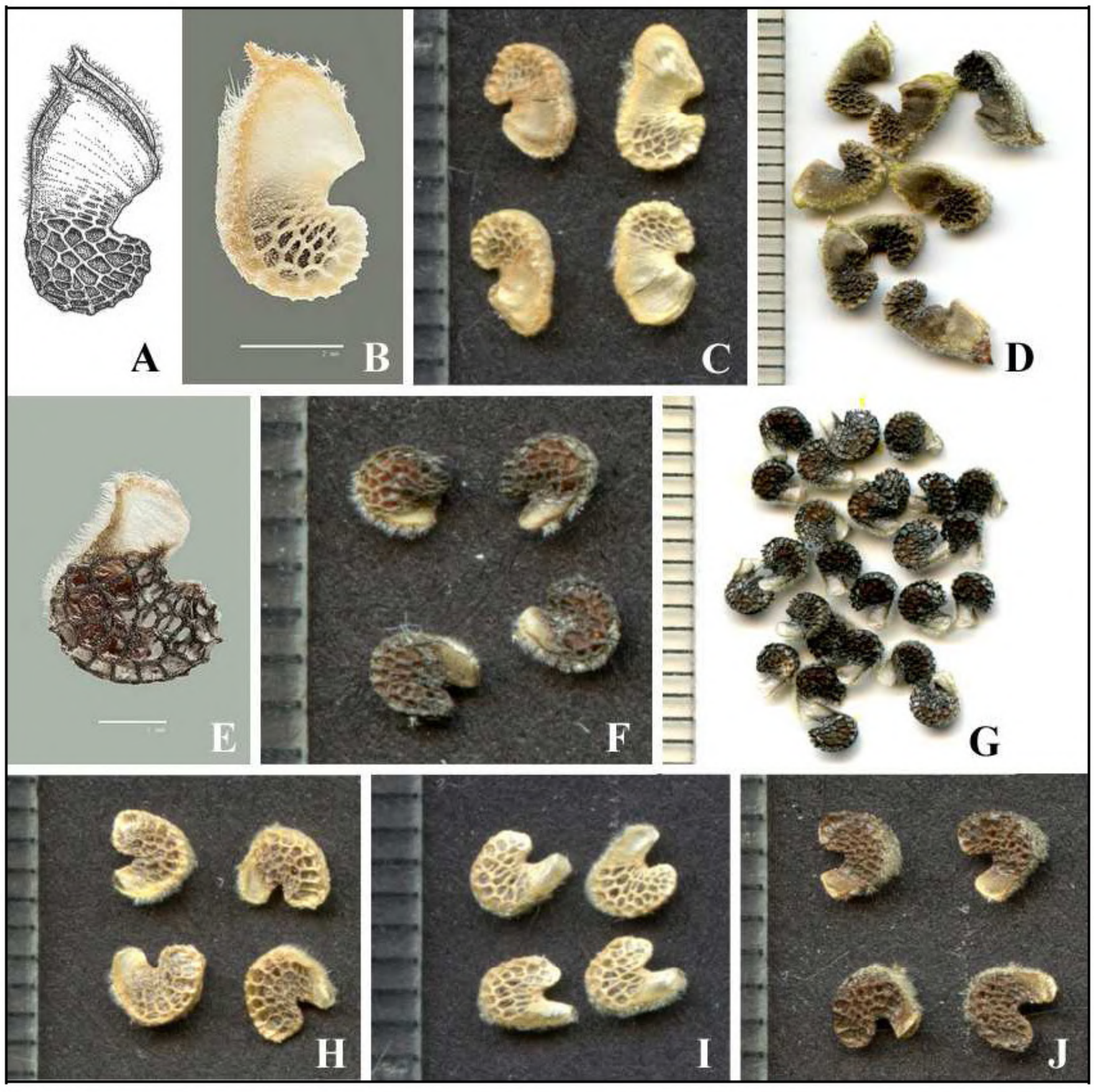

Figure 24. *Sphaeralcea* mericarps. ***S. ambigua***: (A) By Lucretia Breazeale Hamilton; (B) W of Picketpost Mtn, Pinal Co., *Davis 20 Apr 2012*; (C) Cuerda de Leña Wash, 13 Jun 1978, *Bowers 1345*; (D) Hwy 86, mile 62, E of Why, 5 Apr 2015, *Rutman*, scan. ***S. coulteri***: (E) Hayden Butte, Maricopa Co., *Davis 25 Mar 2013* (ASU); (F) Pinacate lava flow, Yuma Co., 20 Mar 1992, *Harlan 58*; (G) Ajo, 23 Mar 2015, *Rutman*, scan. ***S. orcuttii***: (H) Dunes NE of Sierra del Rosario, Sonora, 4 Mar 1972, *Felger 20436*; (I) 30 mi N of San Felipe, Baja California, 17 Mar 1960, *Wiggins 15774*; (J) Dunas costeras, Bahía de Adair, Sonora, *Ezcurra May 1981*.

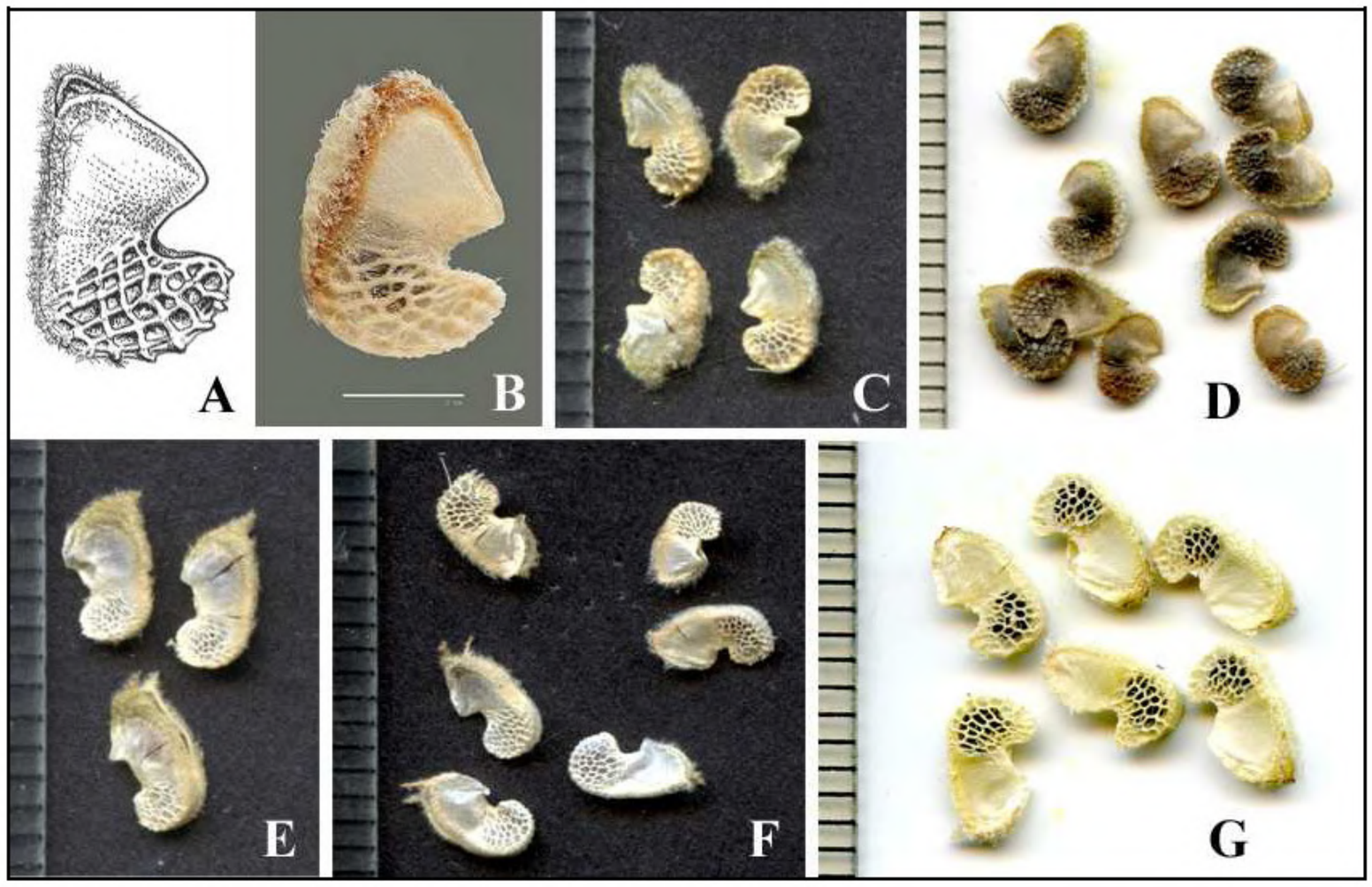

Figure 25. *Sphaeralcea* mericarps. ***S. emoryi***: (A) By Lucretia Breazeale Hamilton; (B) Pyramid Peak Parkway, between Sonoran Mountain Ranch Rd and 67th Ave, Maricopa Co., *Davis 28 Apr 2012*; (C) Floodplain at confluence of Alamo and Cherioni washes, *Warrren 10 Nov 1983*; (D) Midway Wash, Maricopa Co., 18 Mar 2015, *Rutman*, scan. ***S. laxa***: (E) Alamo Canyon, 19 Apr 1942, *Cooper 747*; (F) Estes Canyon wash bed, 0.5 mi upstream from trailhead, 17 May 2015, *Rutman*, scan; (G) Alamo Canyon, 0.5 mi upstream from campground, 4 Apr 2015, *Rutman*, scan.

These plants have been widely used medicinally, especially the roots for eye ailments, although the herbage is well known to cause eye irritations, as indicated by the common name *mal de ojo* in Mexico (Felger 2007; Felger & Moser 1985; Kearney & Peebles 1960; Rea 1997). La Duke (2015: 357), who has spent decades studying the genus, writes: "*Sphaeralcea* is often collected and somewhat difficult to identify. The species boundaries are not always sharp because there is frequent hybridization, polyploidy, and morphological variation in response to environmental conditions, particularly rainfall. Plants growing in Arizona are particularly difficult to identify."

In the following keys and descriptions, mericarp measurements are the length of the longest axis.

1. Ephemerals/annuals (sometimes may appear perennial), often taller than wide; mericarps 1-seeded, the dehiscent section short and stubby, less than half as long as the body.
…… **Sphaeralcea coulteri/orcuttii**
1. Perennials; mericarps 2- or 3-seeded, the dehiscent section more than half as long as the body.

2. Leaves deeply and notably 3-lobed; inflorescence an open and few-flowered panicle
…….. **Sphaeralcea laxa**
2. Leaves not especially deeply lobed; inflorescence an interrupted, many-flowered raceme or panicle.

3. Mostly globose bushes, often at least as broad as tall; leaf blades as long as or slightly longer than wide; petals orange or sometimes pinkish; mericarps 2-seeded……... **Sphaeralcea ambigua**
3. Plants often as tall to much taller than broad; leaf blades usually conspicuously longer than wide; petals reddish orange; mericarps 2- or 3-seeded …….. **Sphaeralcea emoryi**

Sphaeralcea ambigua A. Gray subsp. **ambigua**
Desert globe-mallow; *mal de ojo*. Figures 24A–D & 26.

Bushy perennials, becoming moderately woody at base, often globose and reaching 1 (1.3) m but usually smaller. Stems and upper leaf-blade surfaces often with a yellow cast, hairs of lower surfaces usually whiter. Leaf blades mostly 1.8–6 cm long, more or less ovate, often more or less 3-lobed, thinner and larger during more favorable conditions and thicker, smaller, and often wrinkled during drier conditions, the margins variously toothed to wavy. Inflorescences often paniculate. Flowers often relatively large; petals orange, or sometimes pink, (1.5) 2–3+ cm long; anthers and stigmas usually light colored (often white), or sometimes dark purple. Mericarps 2-seeded, light colored, (3) 4–6.4 (7.1) mm long, the upper, dehiscent section larger than the body; mericarps usually rounded at apex, or sometimes with a small apical cusp. Flowering at various seasons, especially in spring.

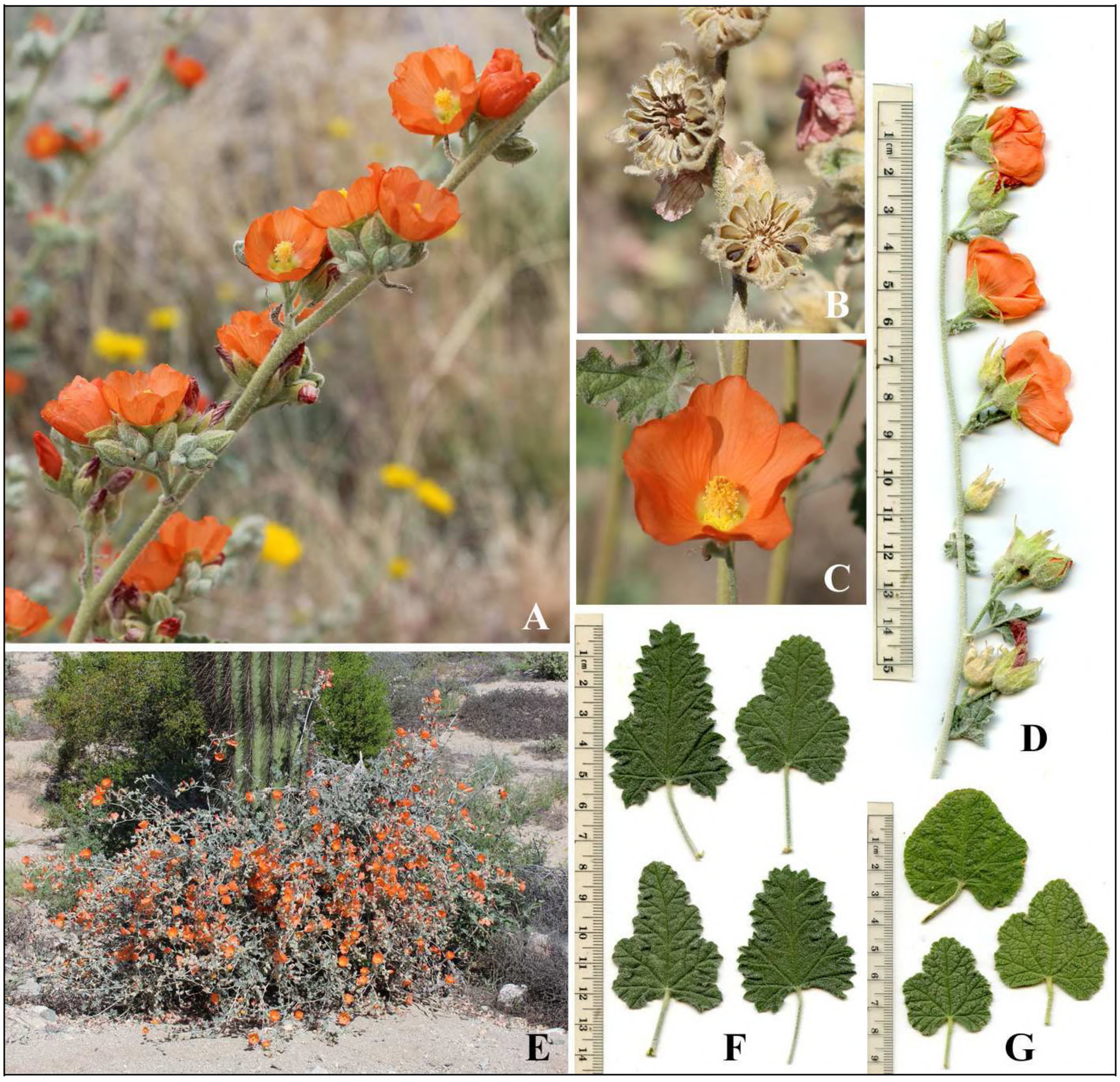

Figure 26. *Sphaeralcea ambigua* subsp. *ambigua*. (A) Hwy 86 mile 62, 22 Feb 2014. (B) Hat Mountain, Sauceda Mts, 22 Mar 2014. (C) Victoria Mine, 1 Apr 2010. (D & E) Knucklehead Wash at base of Childs Mountain, 16 Mar 2015. (F) Twin Peaks, 19 Mar 2015. (G) Just E of Charlie Bell Pass, 16 Mar 2015.

Mostly on rocky slopes, upper bajadas, and washes, but also on well-drained soils of valley plains and roadside along Highway 85; widespread across the flora area. It was in the Ajo Mountains 1200 years ago.

Sphaeralcea ambigua, with 4 subspecies, occurs in southwestern USA and northwestern Mexico. Subsp. *ambigua* is a desert plant and the most widespread of the several infraspecific taxa; Arizona, southwestern Utah and southern Nevada to southeastern California, northwestern Sonora, and the Baja California Peninsula.

OP: 10 mi S of Bates Well, 5 Mar 1940, *Benson 9924*. Quitobaquito, flowers scarlet, 5 Mar 1940, *Peebles 14552*. Ajo Mts, main canyon N of Alamo Canyon, steep rocky, S-facing slopes, 31 Mar 1948, *Gould 4692*. Puerto Blanco Mts, rocky slope above Dripping Springs, 16 Apr 1952, *Parker 7942*. 4.5 mi N of Pozo Nuevo, in wash at roadside, 30 Mar 1978, *Bowers 1145*. Cuerda de Leña Wash near N boundary, 13 Jun 1978, *Bowers 1345*. 2.5 mi E on Puerto Blanco Drive, arroyo, 12 Apr 1986, *Houk 20 & Carter*. Puerto Blanco Drive, 2.4 mi W of Ariz Hwy 85, margins of wash, 19 Jun 1989, *Felger 89-229A*. †Alamo Canyon, mericarps, 1150 ybp.

CP: Tule Tank, 21 Mar 1933, *Shreve 6223*. Tule Mts, 23 Mar 1935, *Kearney 10882*. Small hill near Sheep Mtn, 11 mi W of Organ Pipe W boundary, along stream at base of hill, with *S. emoryi, S. laxa*, 21 Mar 1979, *Mason 3370*. Top of rocky hill S of O'Neil's Grave, 13 Mar 1983, *Mason 3603*. Lava and sand on Pinacate Lava flow, inside crater, taller, redder species, 21 Mar 1992, *Harlan 59* (other species = *S. coulteri*, *Harlan 58*). Charlie Bell Road 0.4 mi W of E boundary of Refuge, small arroyo, 9 Apr 1993, *Felger 93-331*. Daniels Arroyo at Charlie Bell Rd, 9 Apr 1993, *Felger 93-364*. E side Pinacate lava and E Pinta Sands, low dunes encroaching lava field, 11 Apr 1993, *Felger 93-437*. Cabeza Prieta Peak, N facing side of summit, 2550 ft, 24 Mar 1995, *Yeatts 3650*. 0.5 mi S of Sunday Pass, 2600–2700 ft, granite boulders at ridge-top, *Cain 15 Nov 2003*.

TA: 1 mi N of Tinajas Altas, Tinaja Altas Mts, 17 Apr 1948, *Kurtz et al 1173*. Tinajas Altas, just N of tanks, 1800 ft, 10 Mar 1980, *Reichenbacher 481*. Vicinity of Tinajas Altas, 1200 ft, *Van Devender 5 Mar 1983*. Tinajas Altas, 1200 ft, *Van Devender 25 Mar 1983*. Tinajas Altas Mts, canyon bottom in upper canyon, high canyon valley, 1530 ft, 26 Oct 2004, *Felger 04-78* (ARIZ, ASU). Tinajas Altas Mts, below Raven Tank, 1220 ft, deep xeroriparian canyon, 29 Mar 2010, *Felger 10-240*.

Sphaeralcea coulteri (S. Watson) A. Gray
Annual globe-mallow; *mal de ojo*; hadam tatk, ñiatum. Figures 24E–G & 27.

Winter-spring ephemerals with a well-developed taproot, sometimes germinating as early as September, and sometimes also growing with summer rains; extremely variable in size, from less than 10 cm to 1 (2) m tall, the stems slender to stout, often distinctly reddish, sometimes appearing perennial and perhaps sometimes surviving one year or more. Leaf blades highly variable in size, thin and green when vigorously growing, or thick, wrinkled and yellowish in drought, about as broad as long to longer than wide, ovate to orbicular, often shallowly 3-lobed and variously toothed, or hastate (2 large, "eared" lobes at base). Flowers often crowded in slender, many-flowered terminal inflorescences; flowers opening in early morning, sometimes around 8 a.m. The petals yellow-orange to orange, 5–10 (12) mm long. Anthers yellow. Mericarps 1-seeded, 1.7–2.4 (2.6) mm long, about as long as wide; the indehiscent part blackish (light-colored when immature), the dehiscent (upper) part whitish and much smaller than the body.

Seasonally abundant across the flora area, often carpeting the springtime desert with orange. Desert flats, bajadas, washes, canyons, playas, and dunes. This is the most common ephemeral mallow in the region.

Southern Arizona to Sinaloa, and southeastern California to Baja California Sur.

OP: Growler Valley, 20 Mar 1933, *Shreve 6204*. Alamo Canyon, *Nichol 26 Mar 1939*. 10 mi S of Bates Well, 5 Mar 1940, *Benson 9919*. Near Dripping Springs, 16 Apr 1952, *Parker 7943*. 10 mi NW of Headquarters, Dripping Springs Drive, 16 Mar 1965, *Niles 523*. Pozo Nuevo, 30 Mar 1978, *Bowers 1111*.

Floodplain confluence of Alamo and Cherioni Washes, *Warren 10 Nov 1983.* Aguajita, *Beale 8 Apr 1988* (ORPI). W side Sierra Santa Rosa, base of mountain, 12 Mar 2003, *Felger 03-377.*

CP: Near Tule Tank, 23 Mar 1935, *Kearney 10900.* Charlie Bell Well, Growler Mts, *Johnson 26 Mar 1960.* Old ranch site 4.7 mi NE of Tule Well, 28 Mar 1985, *McLaughlin 2978.* Upland, 0.2 mi W of San Cristobal Wash, 20 Mar 1992, *Harlan 013.* Lava and sand on Pinacate lava, shorter, lighter orange than adjacent species [*S. ambigua, Harlan 59*], 20 Mar 1992, *Harlan 058.* Las Playas, clayish soil with mesquite shrubs, 11 Jan 2002, *Felger 02-38.* 5 mi N of Tule Tank on road to Christmas Pass, large wash, 2 Feb 1992, *Felger 92-74.* Mohawk Valley, 12 mi of road between Christmas Pass and the N Refuge Boundary, miles of this plant, 13 Apr 1992, *Harlan 263.*

TA: Coyote Water, banks of wash, 1.5–1.8 (2) m tall, few-branched erect stems, 21 Feb 2005, *Felger 05-141.* High Tanks Gate, 18 Mar 1998, *Felger 98-111.*

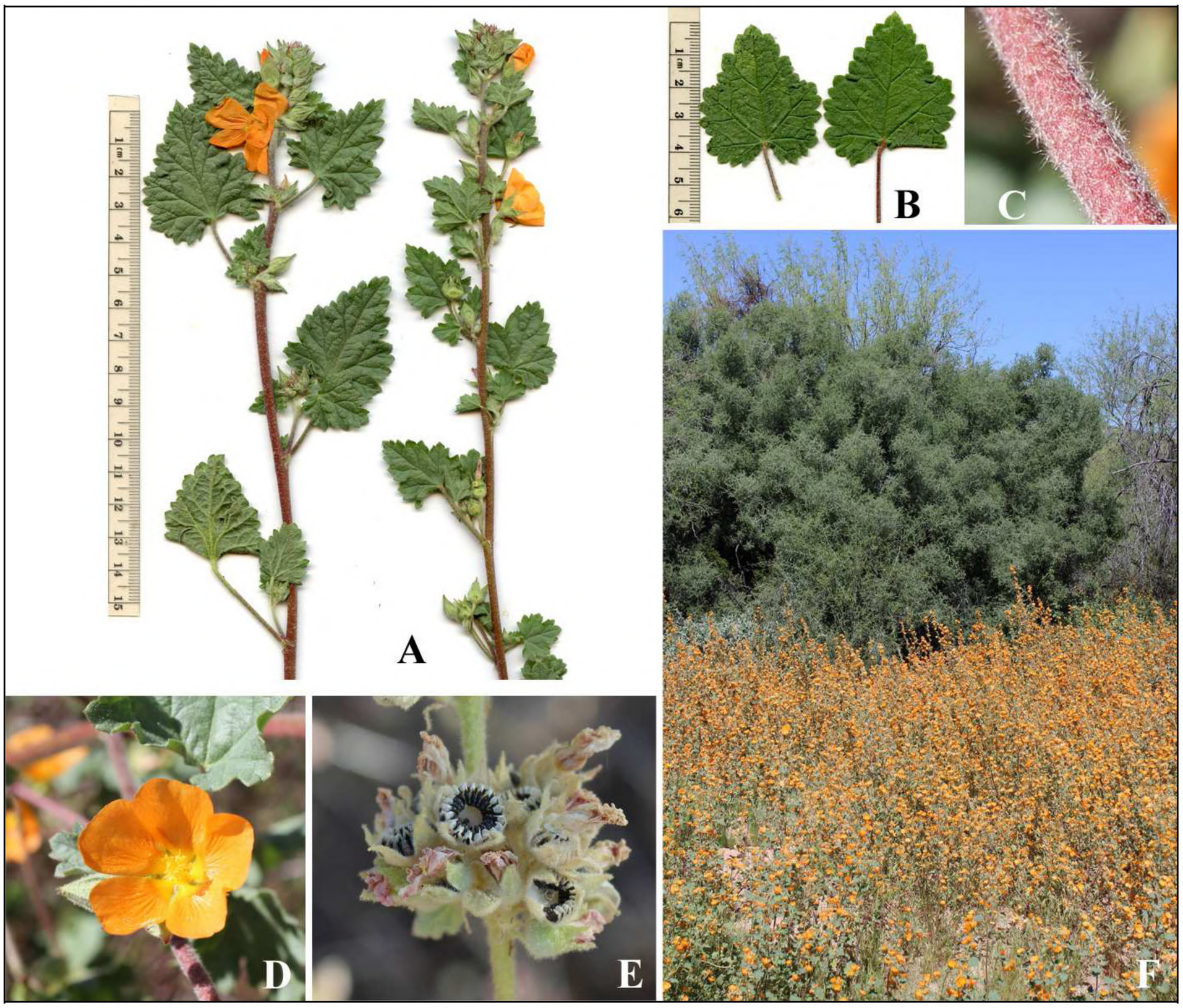

Figure 27. *Sphaeralcea coulteri.* (A) Wash near Hwy 85, N boundary of Organ Pipe, 14 Feb 2015. (B & E) Hwy 86 near mile 62, E of Why, 5 Apr 2015. (C & D) Kuakatch Wash near Kuakatch Village, 3 Mar 2014. (F) La Abra Plain, S Puerto Blanco Drive, 15 Mar 2015.

Sphaeralcea emoryi Torrey ex A. Gray subsp. **emoryi**
Emory globe-mallow; *mal de ojo*. Figures 25A–D & 28.

Ephemerals to short-lived perennials, herbaceous to subshrubs 0.5–2+ m tall. Stems erect to floppy and curving in shaded habitats and with age. Leaves 4–14.5 cm long, highly variable, the blades conspicuously longer than wide and broadest near the base, 3-lobed and relatively thin, or

ovate and thicker with drier conditions; petioles prominent. Inflorescences slender, the flowers in glomerate clusters crowded at nodes. Petals reddish orange, 1.4–1.8+ cm long. Anthers light colored, white or yellow, or sometimes medium-dark colored, stigmas light colored, occasionally dark. Mericarps 2- or 3-seeded (if 1-seeded, then other(s) fell out), light colored, longer than wide with a deep notch; the dehiscent section about as wide as the body; indehiscent part ca. 40% of carpel, with small windows in the coarse reticulations. Mericarps 2.6–7.1 mm long including short to long cusp 0.3–1.2 mm long. Flowering with spring and summer-fall rains.

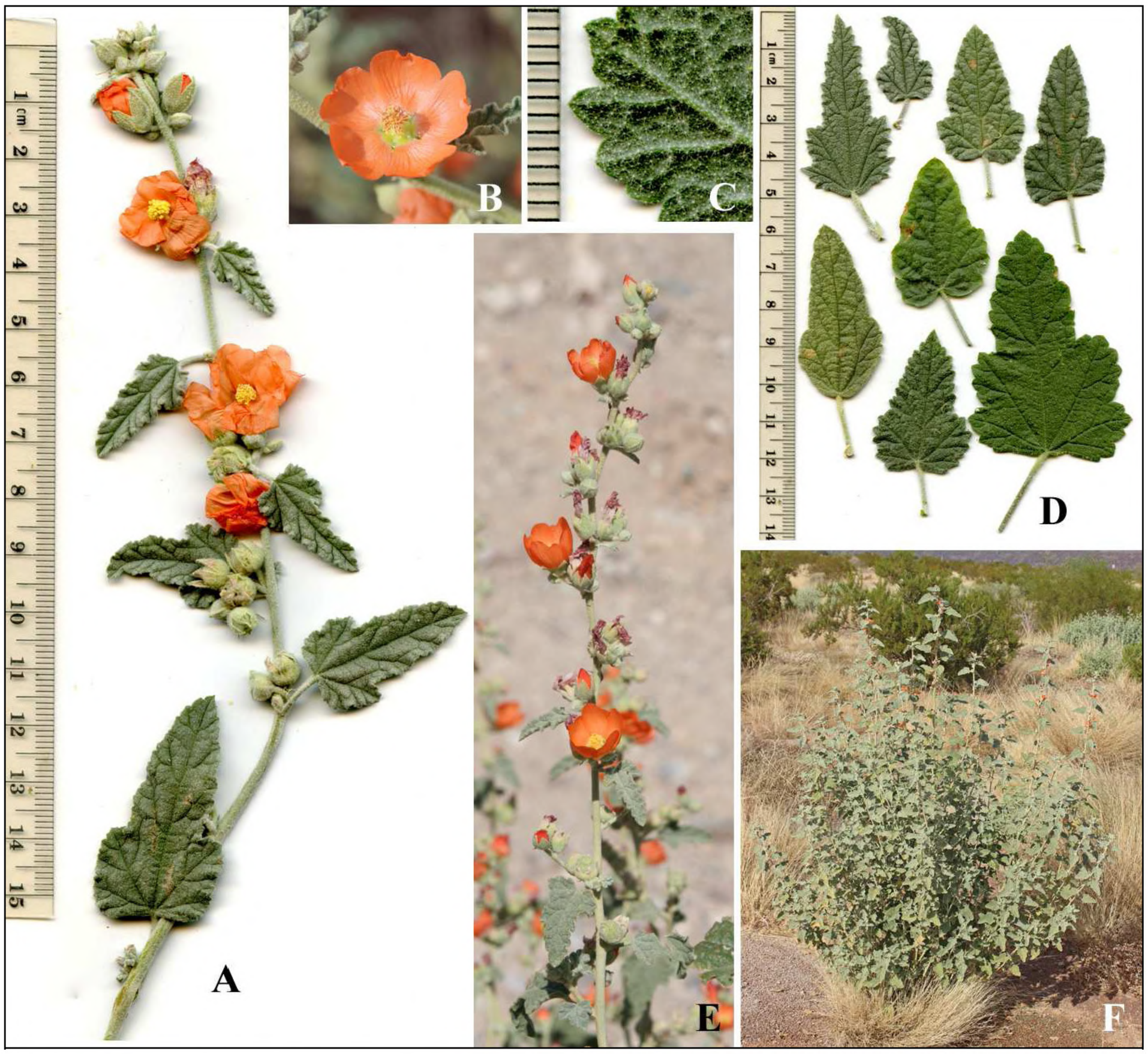

Figure 28. *Sphaeralcea emoryi.* (A, C & D) Ajo, 13 May 2015. (B) Hwy 86, San Simon, Tohono O'odham Reservation, 4 Mar 2014. (E) Darby Wash near Hwy 85, 6 May 2006. (F) E of Hwy 85, S of Crater Range, 4 Dec 2014.

Playas, washes, canyon bottoms, and charcos, often on finer-textured soils; widely scattered and generally localized in Organ Pipe and the eastern part of Cabeza Prieta, the southern margin of Cabeza Prieta at Las Playas and vicinity, and the Lechuguilla Valley at the Camino del Diablo.

Arizona to Sinaloa, southern Nevada, southeastern California, and Baja California.

Although La Duke (2015) does not recognize infraspecific taxa of *Sphaeralcea emoryi*, there are two extremes that seem to warrant recognition. Subsp. *emoryi*, often occurring with arid conditions, tends to become tall, sometimes woody and pubescent with thicker, more rounded, and less deeply toothed/lobed leaves, and generally darker orange petals and whitish/cream anthers and stigmas and yellow pollen. The herbaceous ruderal, narrow-leaved and much less pubescent subsp. *variabilis* (Cockerell) Kearney usually has darker anthers and stigmas. Plants in the flora area are readily accommodated as subsp. *emoryi*, although in other regions there are often intermediates between the subspecies and with *S. ambigua*.

Sphaeralcea emoryi and *S. angustifolia* sometimes can be almost inseparable. Some specimens from the flora area have large, narrow lanceolate leaves resembling *S. angustifolia*. *Sphaeralcea angustifolia* has narrow, lanceolate leaves and the mericarps persistent on the column when the fruits are completely mature.

OP: Alamo Canyon, *Nichol 26 Mar 1939*. Near Quitobaquito, 5 Mar 1940, *Peebles 14556*. Between Williams Spring and Quitobaquito, 10 May 1979, *Bowers 1719*. Quitobaquito: 13 Apr 1963, *Felger 7650* (mixed collection *S. coulteri*); *Van Devender 30 Aug 1978* (2 sheets: ARIZ 219425 & 219427); Shade of cottonwoods, 23 Jul 1986, *Felger 86-206*; Semi-shade beneath cottonwoods, 26 Apr 1990, *Felger 90-90*. 10 mi S of Bates Well, 5 Mar 1940, *Benson 9921*. Armenta Well, in flooded area of *Larrea* flat, *Warren 16 Nov 1974*. Wash ½ mi N of Pozo Nuevo, 12 Apr 1978, *Bowers 1262*. Floodplain at confluence of Alamo and Cherioni washes, *Warrren 10 Nov 1983*. Puerto Blanco Drive, 4.2 mi w of Hwy 85, arroyo among lower bajada, 3 Dec 1990, *Felger 90-572*.

CP: 11 mi W of ORPI boundary, 3 species of *Sphaeralcea* here, 4 Mar 1977, *Mason 3226*. E side of Agua Dulce Mts, in wash, alternate road to Papago Well, 21 Mar 1979, *Mason 3369*. Playa W of O'Neill Hills, *Harlan 20 Mar 1983*. Las Playas: 100% cover of ephemerals, 31 Jan 1992, *Felger 92-15*; 10 Apr 1993, *Felger 93-381*. San Cristobal Wash: 14 Sep 1992, *Felger 92-689* (2 sheets, ARIZ 300470 & 299028); 10 Apr 1993, *Felger 93-374*; 26 Mar 2010, *Felger 10-107* (ARIZ, ASU). Charlie Bell Road at W branch of Daniels Arroyo, riparian desertscrub, with *S. coulteri*, 10 Apr 1993, *Felger 93-361*. 1.4 mi W of Organ Pipe on Camino del Diablo-Bates Well Road, 26 Sep 2013, *Rutman 20130926-3*.

TA: Lechuguilla Valley, Camino del Diablo, S end of Coyote Wash, mesquite "forest," 28 Mar 2010, *Felger 10-167*.

Sphaeralcea laxa Wooton & Standley
Caliche globe-mallow. Figures 24E–G & 29.

Herbaceous perennials to 80+ cm tall, with sparsely leaved, spreading stems. Stems whitish, leaves canescent, stipules and bracts often pinkish. Leaves often 3–5 cm long, ovate-triangular, longer than wide, deeply 3-lobed with toothed margins, the middle lobe much longer than the lateral ones. Flowers often relatively large and set rather far apart on open, few-branched inflorescences. Pedicels relatively long. Petals bright orange, 1–1.5 cm long; filaments, anthers, and stigmas dark purple or dark reddish purple. Capsules truncate conical. Mericarps 2-seeded, 4.2–6.5 mm long, usually with a mucro or cusp to 0.2 mm long on the apical end of carpel. Mericarps notably longer than wide, the dehiscent part usually longer and wider than the indehiscent part, the indehiscent part often about 40% of the whole mericarp, with small windows and rather fine reticulations (like a fish net).

Common in the Ajo Mountains, canyons and mostly higher elevations, and occasionally elsewhere in Organ Pipe.

Northward and eastward in Arizona to western Texas and northern Sonora.

OP: Alamo Canyon: 13 Sep 1941, *Goodding 297-41*; 19 Dec 1945, *Goodding & Supernaugh 478-45*; Floor of canyon, alluvial wash, flowers rose-pink, 19 Apr 1942, *Cooper 747*; 12 Apr 1978, *Bowers 1252*. Estes Canyon, 2785 ft, 9 Apr 2005, *Felger 05-166*. Trail from The Cones to Mount Ajo, 4090 ft, 10 Apr 2005, *Felger 05-293*.

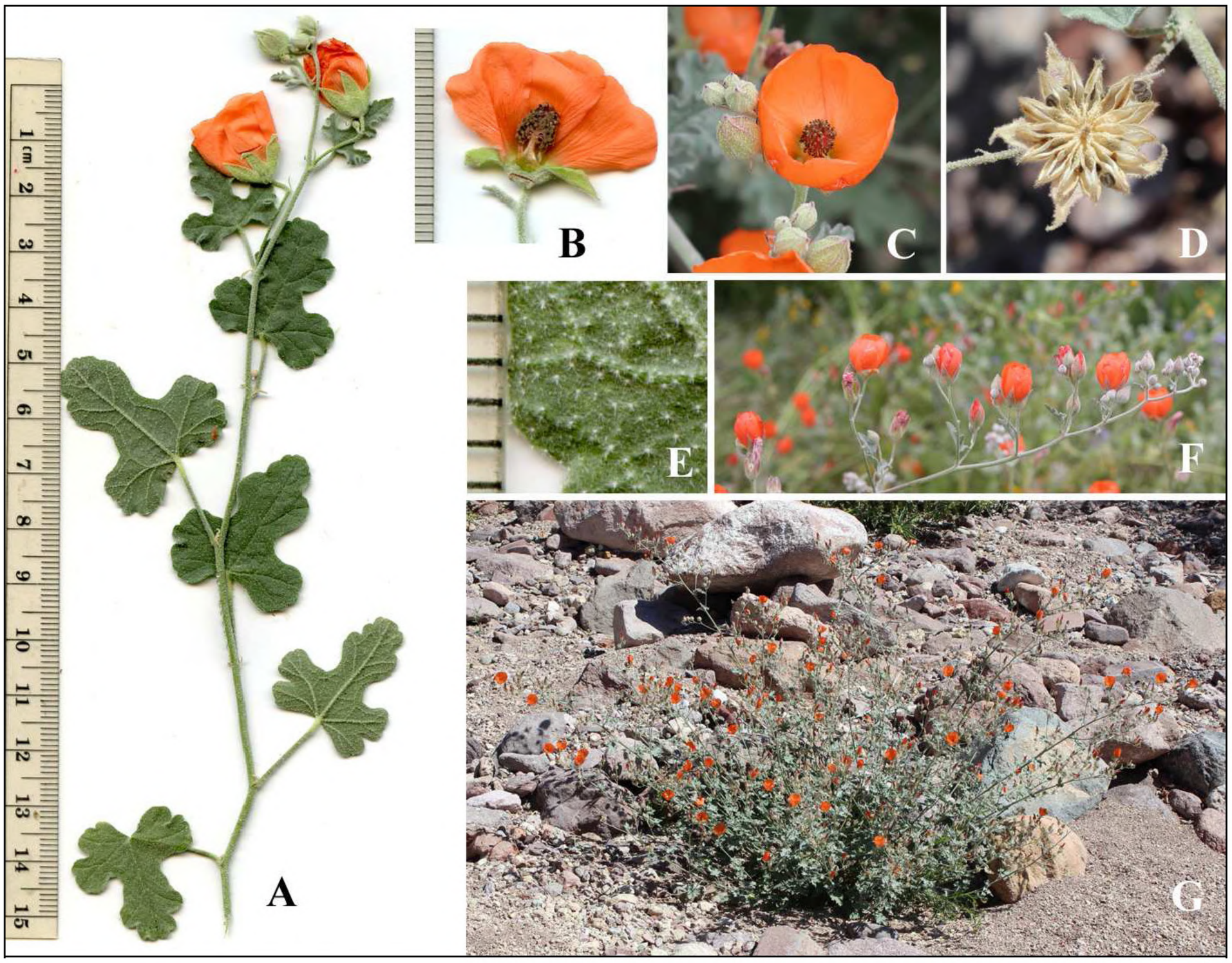

Figure 29. *Sphaeralcea laxa*. Alamo Canyon: (A & E) 3 Sep 2014; (D) 4 Apr 2015. Estes Canyon: (B) 22 Mar 2015; (F) 18 Mar 2005; (G) 7 Mar 2014. (C) Hwy 86 near Quijotoa, 22 Feb 2014.

Sphaeralcea orcuttii Rose
Figures 24H–J & 30.

Large, robust plants with erect-growing stems, often 1–2.5 m tall, resembling *S. coulterii*. These plants occur on stabilized dunes and sand flats in Cabeza Prieta, such as the Pinta Sands, as well as the adjacent Gran Desierto of northwestern Sonora and similar plants are found elsewhere in southwestern Arizona. *Sphaeralcea orcuttii* is otherwise known from northeastern Baja California and southeastern California.

Plants often with a single main axis or several major branches from near base of plants. Herbage often yellowish canescent, or leaves with relatively sparse pubescence and green when young and vigorously grown; larger (usually lower) leaves with blades 5.5–8 cm long x 3–7 cm wide, the petioles to 3.7 cm long. Petals orange. Mericarps of *Sphaeralcea coulteri* and *S. orcuttii* seem indistinguishable (Felger 2000) except that *S. orcuttii* is reported to have larger mericarps; we found *S. orcuttii* mericarps only slightly larger: 1.7–2.6 (3.1) mm long (sometimes 2.1–3.0 mm long in the same capsule). Indehiscent part mostly very dark, some light colored and some in between — *S. orcuttii* seems to be more prone to have lighter colored mericarps than *S. coulteri*.

Figure 30. *Sphaeralcea orcuttii*. S side of Interstate 8, 16 air miles E of Yuma, Yuma Desert, Yuma Co., 1 Apr 1973, *Holmgren 6618* (ARIZ).

The morphological and ecological boundaries between *Sphaeralcea coulteri* and *S. orcuttii* seem continuous. *Sphaeralcea orcuttii* joins the ranks of other regional dune and blowing sand taxa and populations that may or may not warrant taxonomic recognition, especially where the sand-inhabiting plants differ primarily by relative gigantism, e.g., *Argythamnia serrata* sensu stricto, *Chamaesaracha felgeri*, *Croton wigginsii* sensu stricto, *Larrea tridentata* var. *arenaria*, *Palafoxia arida* var. *gigantea*, and *Stephanomeria schottii*.

Sphaeralcea coulteri has a dune form that approaches *S. orcuttii*, which seems best treated as an ecotype of *S. coulteri*. Stem pubescence may be a useful feature: *S. orcuttii* has a very short, dense almost velvety pelage. The leaf margin is not very toothed and almost crisped, the lower lobes are not very distinct, and the dried leaves are very brittle. The mericarps are very similar, but the notch is meant to be rather deeper in true *S. orcuttii*. Both species have the basal diploid chromosome number ($n = 5$), possibly facilitating gene flow.

CP: Near Tule Tank, 23 Mar 1935, *Kearney & Peebles 10900*. E edge of Pinta Sands, just E of Pinacate Lava Flow, abundant on gravelly–sandy–volcanic desert pavement, with *Malvella lepidota*, *Hymenoxys odorata*, 17 Apr 1983, *Hodgson H2077* (ASU, DES). Pinta Sands, low dunes, abundant, 1–1.3 m tall, 2 Feb 1992, *Felger 92-24*.

†**Sphaeralcea** sp./spp. (possibly, or possibly including *S. ambigua*)

OP: †Puerto Blanco Mts, on ridge, carpels, 3220 to 9860 (4 samples).

TA: †Butler Mts, twigs, leaf fragments, mericarps, 740 to 11,250 ybp (4 samples). Tinajas Altas, leaf fragments, mericarps, seed, 4010 to 10,950 ybp (10 samples).

MARTYNIACEAE – Devil's Claw Family

Annual and perennial herbs. Americas; 4 genera, 16 species.

Proboscidea – Devil's claw, unicorn-plant; *uña de gato, cuernitos*

Ephemerals or perennial herbs, glandular-sticky with mucilage-filled hairs, the surfaces slimy when fresh. Leaves opposite below, mostly alternate above, simple, with relatively long petioles; without stipules. Inflorescences of terminal racemes. Flowers bilateral, the corollas sympetalous and 2-lipped. Ovary superior with a basal nectar-producing disk. The green fruits develop a long, hooked beak. As the fruits mature and dry, the glandular-sticky green pericarp peels away from the woody capsule and the beak splits into 2 large claws. Americas; 8 species.

The unique, dry, woody capsules can be found at any time of year. The large claws may hook onto an animal's leg; dispersal agents probably include bighorn sheep, pronghorn, coyotes, and jackrabbits. Capsules multiple-seeded, the seeds sculptured.

1. Perennials with a large tuberous root; flowers yellow..... **Proboscidea altheifolia**
1. Ephemerals, the roots not tuberous; flowers pale lavender..... **Proboscidea parviflora**

Proboscidea altheifolia (Bentham) Decaisne

Desert devil's claw, desert unicorn-plant; *cuernitos, uña de gato*; ban 'ihugga. Figure 31.

Strongly scented herbaceous perennials from a deeply buried, large, thick, single tuberous root. The shoots emerging with warm weather in spring or about when the summer rains begin and withering with post-summer drought. Stems and petioles semi-succulent. Leaves often with petioles 4–11 cm long, the blades 2–6 cm long, broadly ovate, orbicular, or kidney-shaped and shallowly lobed. Flowers showy, often 4 cm long, the corollas bright yellow inside the tube and on lobes, with brown-purple speckles and dark yellow-orange nectar guides, the tube often bronze colored outside; flowering with hot weather. Capsule body 4–6.6 cm long, the claws 9–14 cm long. Seeds 6–9.2 mm long, obovoid, blackish, and warty.

Sandy to silty or clayish soils, mostly in washes, floodplains, and on creosotebush and saltbush plains; widely scattered across the flora area.

Southeastern California to western Texas, both states of Baja California, Sonora, and Sinaloa, and disjunct in Peru.

The large tuberous roots were peeled and the outer portion (cortex) eaten fresh by the Seris (Felger & Moser 1985). The seeds are edible, and the capsule fibers were used in basketry when *Proboscidea parviflora* was not available (Felger et al. 1992).

OP: 2 mi SE of Walls Well, 30 Aug 1945, *Gould 3217*. Quitobaquito, 25 Jul 1978, *Bowers 1387*. Puerto Blanco Drive 4 mi W of Hwy 85, 18 Sep 1988, *Wilson 198*.

CP: Daniels Arroyo at Charlie Bell Rd, 18 Aug 1992, *Felger 92-675* (CAB). 1 mi E of Namer's Grave, 15 Sep 1992, *Felger 92-767*. Tule Tank, 2 Feb 1992, *Felger 92-66*.

TA: Camino del Diablo, SE of Raven Butte, 25 Oct 2004, *Felger 04-18*.

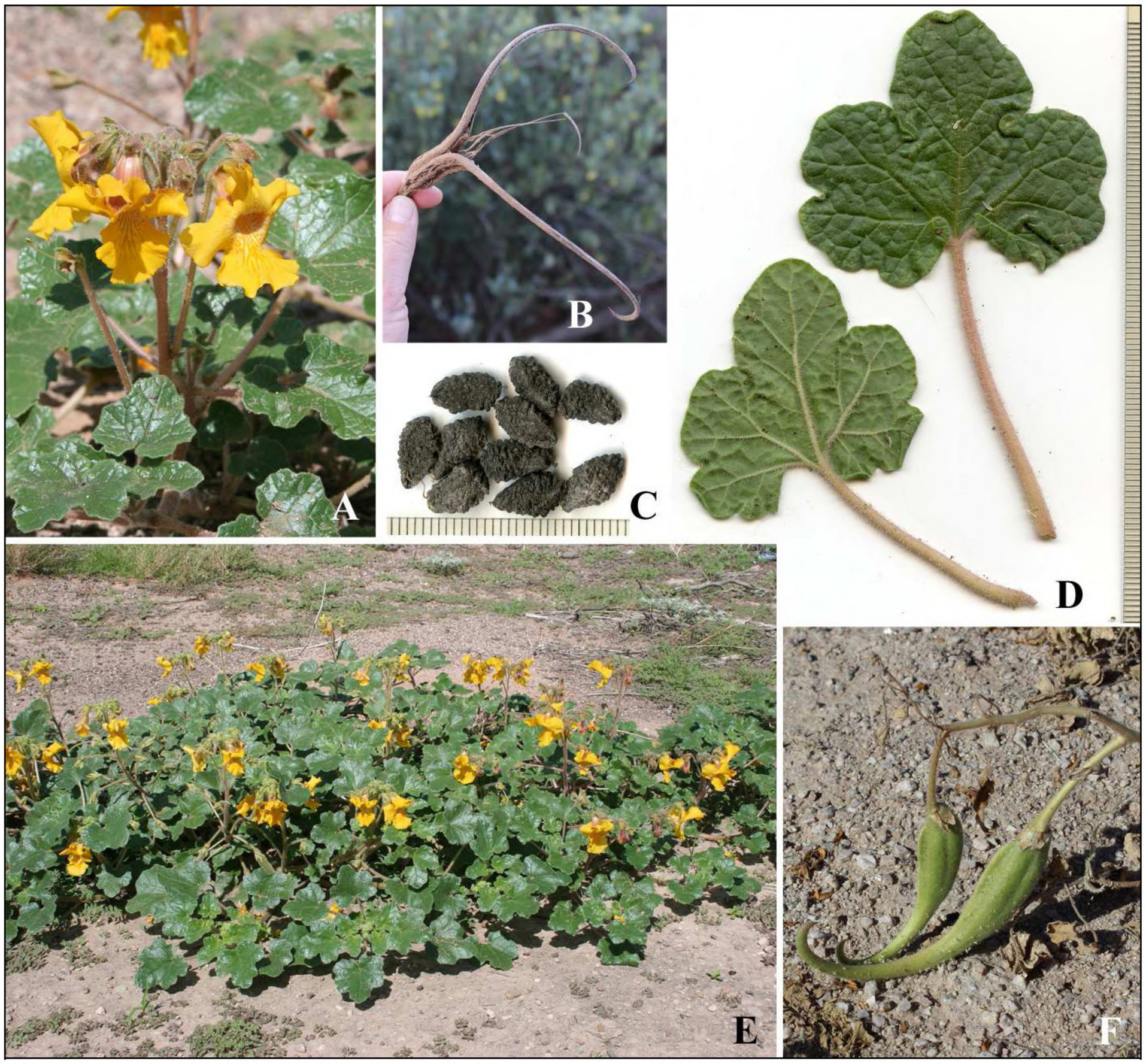

Figure 31. *Proboscidea altheifolia*. (A & E) Hwy 85 between Ajo and Why, 20 Aug 2006. (B) Ripe fruit, Kuakatch Wash near E boundary of Organ Pipe, 30 Jan 2014. (C) Seeds, Why, 20 Oct 2014. (D) Darby Arroyo near Hwy 85, 28 Jul 2014. (F) Unripe fruits, Hwy 85 near N boundary of Organ Pipe, 5 Oct 2013.

Proboscidea parviflora (Wooton) Wooton & Standley subsp. **parviflora**
Devil's claw; *cuernitos, uña de gato*; 'ihug. Figure 32.

Robust summer ephemerals, highly variable in size, sometimes reaching more than 1 m across with favorable conditions, usually much smaller; roots relatively small and poorly developed. Stems and petioles thick and semi-succulent. Larger leaves 12–30 cm long; petioles about as long as the blades, the blades broadly ovate and shallowly lobed. Flowers 3 cm long, the corollas pale lavender with purple blotches and white and yellow nectar guides. Capsule body 5–6 cm long, the claws 10–15+ cm long. Seeds 8 mm long, obovoid, blackish, and warty.

Figure 32. *Proboscidea parviflora* subsp. *parviflora.* Ajo: (A) 17 Sep 2008; (B & C) 2 Sep 2005. (D) Why, 6 Oct 2014.

Canyon bottoms, washes, and arroyos, often on silty-clayish soils and where water may temporarily accumulate; across much of Organ Pipe except the southwestern corner.

This subspecies occurs from southern Utah to central California, eastward to Trans-Pecos Texas and Chihuahua, and southward to northern and western Sonora. Southward in coastal Sonora and Sinaloa subsp. *parviflora* is replaced by subsp. *sinaloensis* (Van Eseltine) Bretting, and another subspecies occurs in Baja California Sur.

The seeds were casually eaten after the tough "husk" was peeled and discarded, and the young fruits were sometimes cooked and eaten. Wild plants have black seeds and shorter claws whereas plants of the domesticated cultivar have white seeds and much longer claws (Hodgson 2001;

Nabhan et al. 1981; Nabhan & Rea 1987; Rea 1997). The cultivar var. *hohokamiana* Bretting is grown by Native Americans in the southwestern USA. It is not known in the wild and has been selected for its much-elongated claws, white seeds, and reduced seed dormancy. Each claw yields a black strip used in basketry. It has been grown in O'odham gardens, likely at Quitobaquito and elsewhere. However, Betty Melvin said that "the Sand Papago didn't really use devil's claw" (Zepeda 1985: 61).

OP: Armenta Well, *Warren 16 Nov 1974*. Bull Pasture, *Wirt 13 Aug 1990*. Dos Lomitas, *Warren 17 Nov 1974*.

MOLLUGINACEAE – Carpetweed Family

Small ephemerals (in the Sonoran Desert Region). Leaves simple, entire. Flowers mostly small and inconspicuous, bisexual and radial. Ovary superior. Sepals 5; petals absent. Fruits of small capsules.

Worldwide, mostly tropics and subtropics; 14 genera, 125 species.

1. Plants pubescent with star-shaped hairs..... **Glinus**
1. Plants glabrous..... **Mollugo**

Glinus

Mostly tropics and subtropics. Worldwide, 6 species.

***Glinus radiatus** (Ruiz & Pavón) Rohrbach
Shining damascisa. Figure 33.

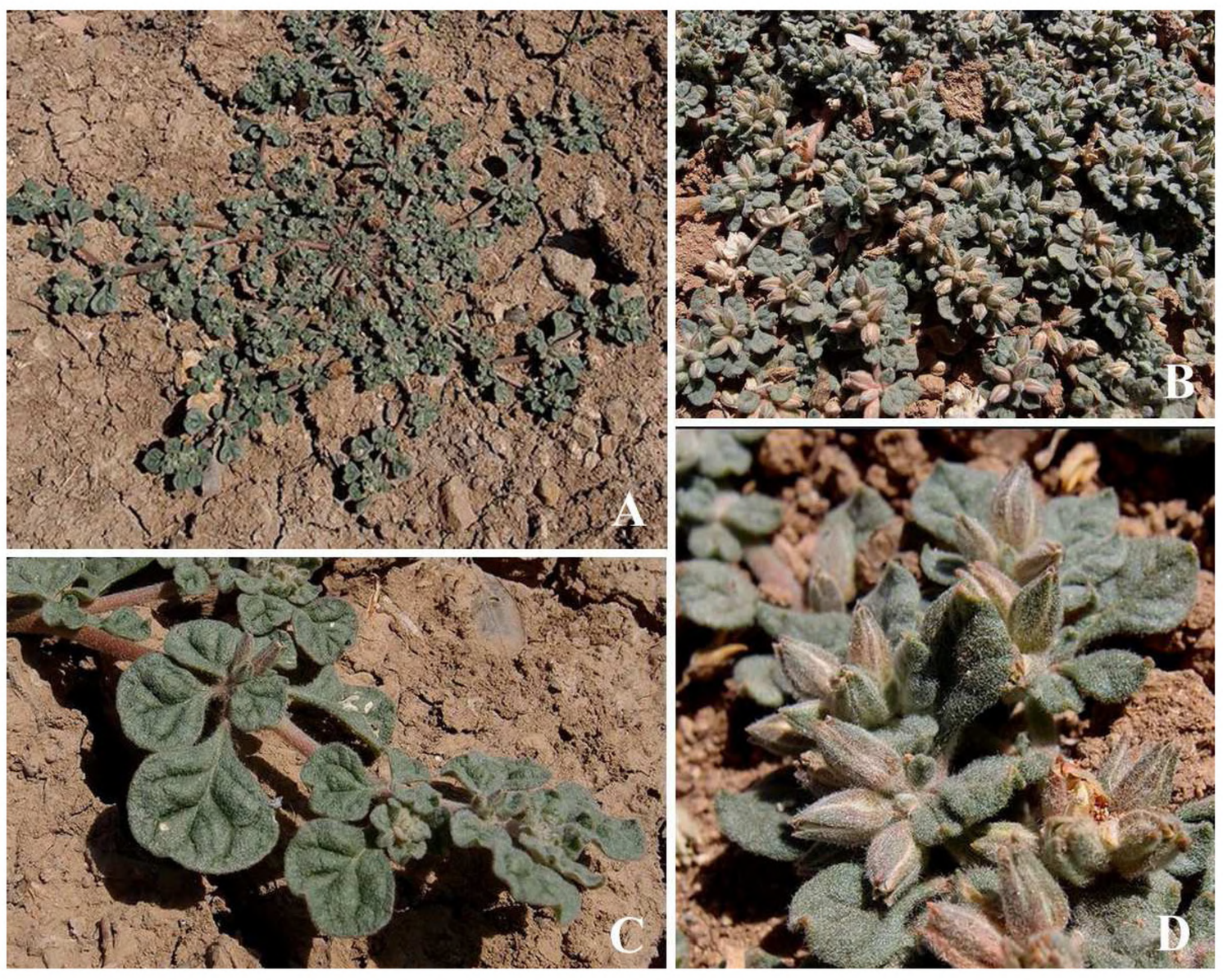

Figure 33. *Glinus radiatus*. Salero Ranch, Santa Cruz Co.: (A & C) 26 May 2013; (B & D) 2 Jul 2014. Photos by Sue Carnahan.

Small ephemerals, apparently non-seasonal; densely gray-pubescent with stellate hairs, the young plants erect to spreading, the older plants prostrate and developing a relatively deep tap root. Leaves whorled, petioled, the blades 5–25 mm long, obovate to orbicular or broadly spatulate. Flowers inconspicuous in axillary clusters, 4 mm long, white and green. Fruits of small capsules with many seeds.

Seasonally and locally abundant in drying mud of dirt charcos in Cabeza Prieta and sometimes in drying mud holes along washes. These are the only records for this species in Arizona.

Native to tropical and subtropical areas in the Americas and naturalized from southern California to Texas.

CP: Cabeza Prieta, in a wash, 8 Oct 1977, *Phelps 12* (ASU, det. Tim Reeves 1980). Jose Juan Tank, 12 Jun 1992, *Felger 92-565*. Redtail Tank, 12 Jun 1992, *Felger 92-552*.

Mollugo

Annuals, herbaceous perennials, and shrubs. Nearly worldwide, 35 species.

Mollugo cerviana (Linnaeus) Séringe

Thread-stem carpetweed, Indian chickweed. Figure 34.

Diminutive summer-fall ephemerals; glabrous. Stems thread-like, 4–13.5 cm long, ascending to spreading, often orange. Leaves somewhat glaucous; first leaves in a basal rosette (an unusual feature among hot-weather ephemerals), 3.5–11 × 1–2 mm, linear-spatulate to spatulate; stem leaves whorled, 6–14.5 × 0.3–1.1 mm, linear to linear-spatulate; stipules none. Flowers on thread-like axillary pedicels. Sepals 5, separate, and persistent, 1.2–1.7 mm long, thin, green especially along veins and with white membranous margins. Stamens 5. Capsules globose, 1.2–1.5 mm wide, multiple-seeded. Seeds 0.33–0.42 mm wide, snail-shaped, minutely reticulate with faint striae (low, thin lines) on the dorsal side, uniformly red-brown.

Figure 34. *Mollugo cerviana*. Dunes about 25 mi SW of Sonoyta on Mex Hwy 8, 12 Sep 2014.

Sandy soils of desert flats, washes and floodplains, perhaps sometimes on rocky soils, in the southwestern part of Organ Pipe and westward in Cabeza Prieta, and Coyote Wash in the Lechuguilla Valley.

Widespread in the Sonoran Desert and elsewhere in southwestern North America and Mexico as well as warm regions worldwide; reported as native to the Old World.

OP: Aguajita Wash, 14 Sep 1988, *Felger 88-419*. Senita Basin, 2640 ft, *Wirt 28 Jul 1990*.
CP: Jose Juan Tank, sand flats near the charco, 14 Sep 1992, *Felger 92-715*.
TA: Coyote Water, 25 Oct 2004, *Felger 04-50*.

MONTIACEAE — Miner's Lettuce Family

Annual and perennial succulent and semi-succulent herbs. Flowers radial. Fruits of capsules. These plants classically have been included in the Portulaca Family (Portulacaceae) and more recently placed in the miner's lettuce family.

Nearly worldwide; 22 genera, 230 species.

1. Summer-fall perennials growing with warm weather; first leaves not in a basal rosette; flowers yellow-orange, solitary in leaf axils..... **Phemeranthus**
1. Winter-spring ephemerals, the lower (first) leaves in a basal rosette; flowers not yellow-orange.

2. Lower leaves with conspicuous petioles, the petioles and blades distinct; leaves below (subtending) the inflorescence sessile and disk-shaped (these perfoliate, formed of fused opposite leaves surrounding the stem)..... **Claytonia**
2. Leaves with indistinct petioles; leaves beneath flowers reduced and not disk-shaped.

3. Petals 5; capsules 3-valved, ovate to globose..... **Calandrinia**
3. Petals 3; capsules 2-valved, oblong or cylindrical..... **Calyptridium**

Calandrinia

Annual to herbaceous perennials, succulent; western Americas, 14 species.

Calandrinia menziesii (Hooker) Torrey & A. Gray
[*Claytonia ciliata* var. *menziesii* (Hooker) J.F. Macbride]
Fringed redmaids. Figure 35.

Succulent winter-spring ephemerals. Stems to 20 cm long, ascending, spreading, or prostrate. Leaves alternate, to about 10 cm long, sessile, linear to oblanceolate, glabrous or ciliate, in basal rosettes and alternate on flowering stems. Inflorescences of racemes with leaf-like bracts and the flowers 2–15 on one side of the branch. Flowers on pedicels 4–13 mm long; sepals 2, scarious, 2.5–8 mm long; petals 5, 4–11 mm long, pink-purple. Capsules with 3 valves opening longitudinally from the tip, and multiple-seeded.

Ajo Mountains and locally in the Puerto Blanco Mountains. The plants were eaten as greens in spring (Hodgson 2001).

Eastward in southern and central Arizona; British Columbia to South America.

The North American plants were formerly known as *Calandrinia ciliata* (Ruiz & Pavón) de Candolle, a species occurring in South America (Hershkovitz 2006).

OP: Alamo Canyon, 1 Apr 1944, *Clark 11555* (ORPI). Near Jackson's Hole, N-central Puerto Blanco Mts, *Rutman 4 Mar 1998* (ORPI). Armenta Road 1.4 mi W of Hwy 85, 11 Mar 2003, *Felger 03-264*. Bull Pasture, 10 Apr 2005, *Felger 05-206*.

Figure 35. *Calandrinia menziesii.* (A & B) Bull Pasture Trail, just below Bull Pasture, 28 Feb 2009. (C) Alamo Canyon, 26 Feb 2014.

Calyptridium – Pussypaws

Annual and perennial herbs. Americas; 9 species.

Calyptridium monandrum Nuttall
[*Cistanthe monandra* (Nuttall) Hershkovitz]
Sand-cress. Figure 36.

Winter-spring ephemerals; plants often reddish, the stems to 15 cm long, spreading to ascending. Early leaves in a basal rosette, well-developed and withering by flowering time, to 7.5 cm long, spatulate and entire; stem leaves alternate and reduced. Inflorescences of 1-sided racemes, with ovate to elliptic bracts. Flowers sessile, sepals 2, fleshy, scarious-margined in fruit, 1–3 mm long; petals 3, white to pinkish or reddish, 1–3 mm long; stamens 1; stigmas 2 and sessile. Capsules with 2 valves, ovoid to cylindrical, 2.5–8 mm long, with 1–10, smooth, black, and shiny seeds.

Canyons and washes in the northern part of Organ Pipe and the Ajo Mountains, often abundant at higher elevations in the Ajo Mountains.

Southern and central Arizona, California, Nevada, Baja California, and northern Sonora; largely in non-desert habitats.

OP: Alamo Canyon, *Nichol 14 Mar 1939*. Estes Canyon, 11 Apr 1978, *Bowers 1237* (ORPI). S of Armenta Ranch road, 27 Feb 2003, *Rutman 2003-197* (ORPI). Kuakatch Wash near E boundary, 2 Mar 2003, *Rutman 2003-214* (ORPI).

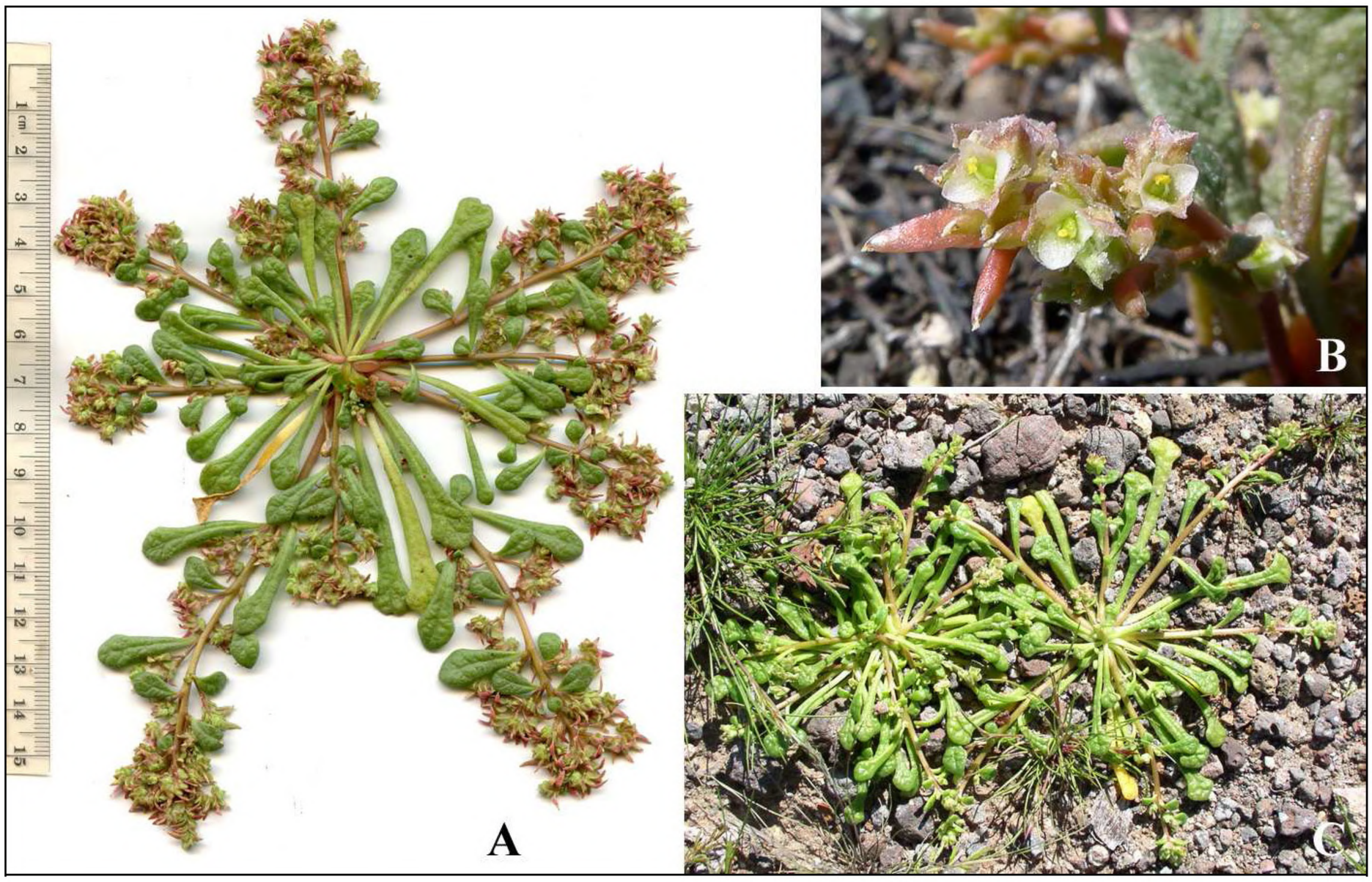

Figure 36. *Calyptridium monandrum.* (A) Kuakatch Wash near E boundary of Organ Pipe, 11 Mar 2015. (B) Anza Borrego State Park, San Diego Co., 20 Apr 2013, photo by Keir Morse (CalPhotos). (C) Chuckwalla Hills, 6 Feb 2005.

Claytonia

Annual to perennial herbs. North and Central America, and Asia; 27 species.

Claytonia perfoliata Donn ex Willdenow subsp. **mexicana** (Rydberg) J.M. Miller & K.L. Chambers
[*Montia perfoliata* (Donn ex Willdenow) Howell]
Miner's lettuce. Figure 37.

Semi-succulent glabrous winter-spring ephemerals to 25 cm tall. Leaves basal, often 2–10+ cm long, highly variable, ovate to oblanceolate or obdeltate; flowering stems slender with 2 fused (perfoliate, connate) disk-like leaves just below the inflorescences. Flowers in small clusters above the connate leaves; sepals 2, 1.5–4 mm long; petals 5, white, 1–3 mm long. Stamens 5. Capsules 3-valved, 1.5–4 mm long, the margins rolling inward and forcibly expelling the seeds when fully ripe. Seeds lens-shaped, brown or black and shiny. As the common name implies, the plants are edible and can refresh a backpacked sandwich.

Ajo Mountains in canyon bottoms and on slopes into the oak zones, especially in moist and partially shaded habitats.

Eastward in southern and central Arizona. This species occurs in British Columbia and western USA to Central America. Subsp. *mexicana* ranges from California to New Mexico and southward to Guatemala; the three subspecies are difficult to identify and their practical significance has been questioned (Howe 2006; Miller & Chambers 2012).

OP: Alamo Canyon, *Nichol 14 Mar 1939*. Pitahaya Canyon, 25 Mar 1990, *Baker 7783* (ORPI). The Cones, on trail to Mount Ajo, 3565 ft, 10 Apr 2005, *Felger 05-243*.

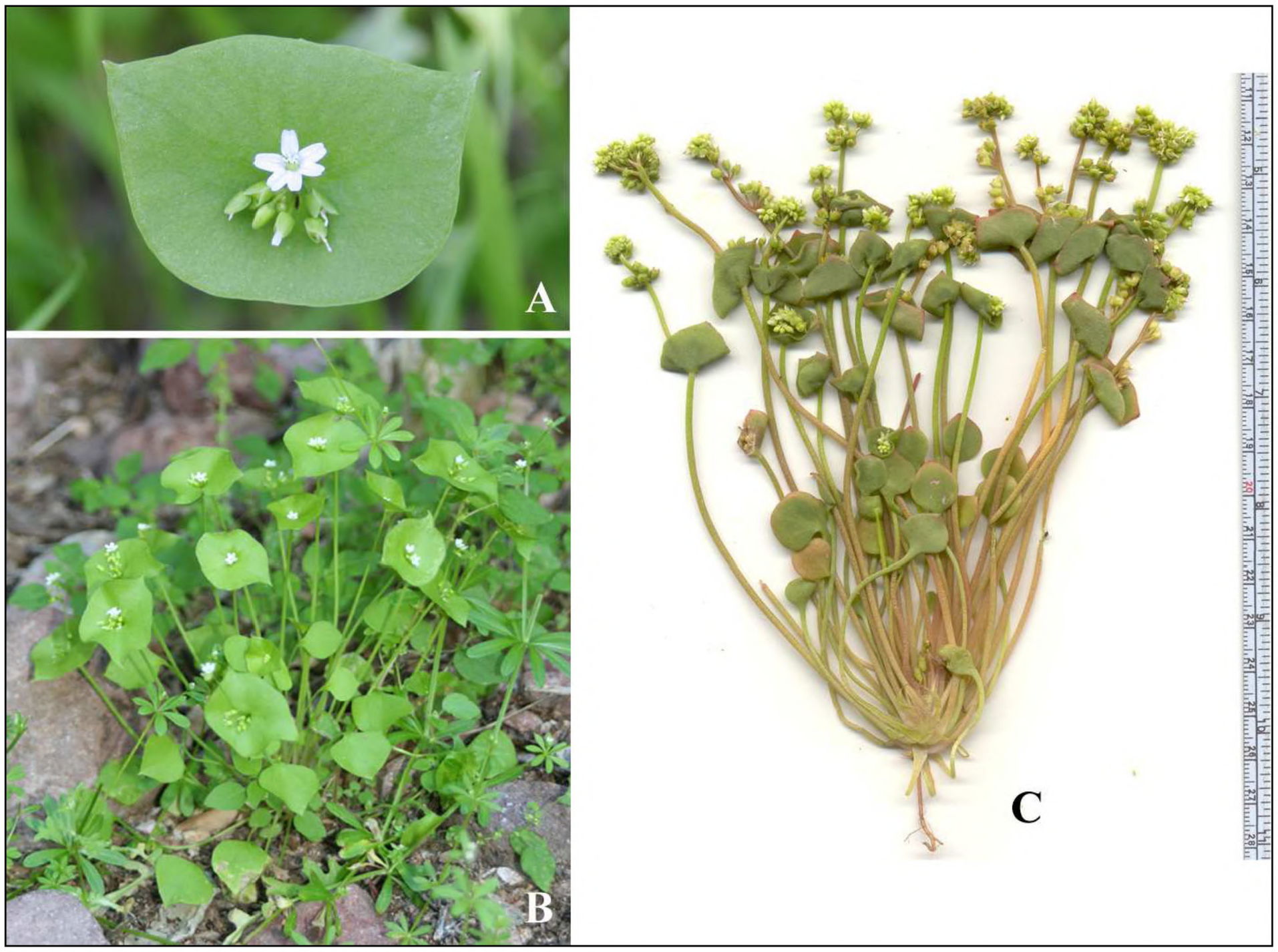

Figure 37. *Claytonia perfoliata* subsp. *mexicana.* Alamo Canyon: (A) 28 Feb 2009; (B) 24 Mar 2008; (C) 12 Mar 2005.

Phemeranthus

Perennial, succulent herbs. Americas; 25–30 species

Phemeranthus aurantiacus (Engelmann) Kiger
[*Talinum aurantiacum* Engelmann. *T. aurantiacum* var. *angustissimum* A. Gray]
Orange flame-flower. Figure 38.

Herbaceous perennial succulents, glabrous, and with tuberous roots; growing during the summer rainy season, dying back to the rootstock after the rains cease. Stems leafy, to 50 cm long. Leaves succulent, alternate, to 6 cm long, mostly narrowly linear but robust new growth may bear broader leaves with 1–few broad, shallow lobes. Flowers 1–3 in leaf axils; sepals 2, ovate, 5–10 mm long and deciduous; petals obovate, 9–15 (20+) mm long, bright yellow to orange; stamens many. Flowers opening for 2–4 hours in the afternoon to early evening of one day, sometimes facultatively cleistogamous. Capsules 3-valved, 4–7 mm long, ovoid to globose, and many-seeded.

Ajo Mountains at least in Alamo and Arch canyons and Bull Pasture, often in shallow soils with *Selaginella arizonica*.

Eastward in southern Arizona, mostly at elevations above the desert; to western Texas, Sonora, and Chihuahua and to Nuevo León and San Luis Potosí.

OP: Bull Pasture, 3300 ft, 9 Aug 1979, *Bowers 1798*.

Figure 38. *Phemeranthus aurantiacus*. (A & C) Bull Pasture, 24 Sep 2006. (B) Salero Ranch, Santa Cruz Co., 31 Jul 2013, photo by Sue Carnahan. (D) Trail to Mt. Ajo, above Bull Pasture, 24 Sep 2006.

MORACEAE – Mulberry Family

Herbs, but mostly shrubs, vines, and trees. Worldwide; 39 genera, 1125 species.

****Ficus** – Fig

Trees, shrubs, and vines. Worldwide, mostly tropical; 750 species.

****Ficus carica** Linnaeus

Fig; *higuera*; su:na. Figure 39.

Large shrubs or small trees. At the end of the 20th century the remnant of a small orchard of mission figs and pomegranates persisted at Quitobaquito along old irrigation ditches below the pond, although many of the trees had perished. By 2010 the last figs finally succumbed, probably due to a combination of lack of water and perhaps age. These trees are said to have been cultivated by the O'odham from Spanish introductions, although Hoy (1970: 48) reported that "Andrew" [Arnold] Dorsey planted fig trees ca. 1860. Hia-Ced O'odham "people would travel to Quitobaquito and harvest the figs. . . and turn the figs into *jun* or jam" (Miguel Velasco in Zepeda 1985: 23, 65).

OP: Quitobaquito: Surviving in a row below the pond along abandoned irrigation ditches, planted here many years ago, seems to be "mission fig" variety, water-stressed, stunted shrubs 2.5 m tall (some much smaller due to extensive die-back), 23 Jul 1986, *Felger 86-221*; Small grove below pond, shrubs to 2 m, barely surviving, 19 Jun 1989, *Felger 89-243*.

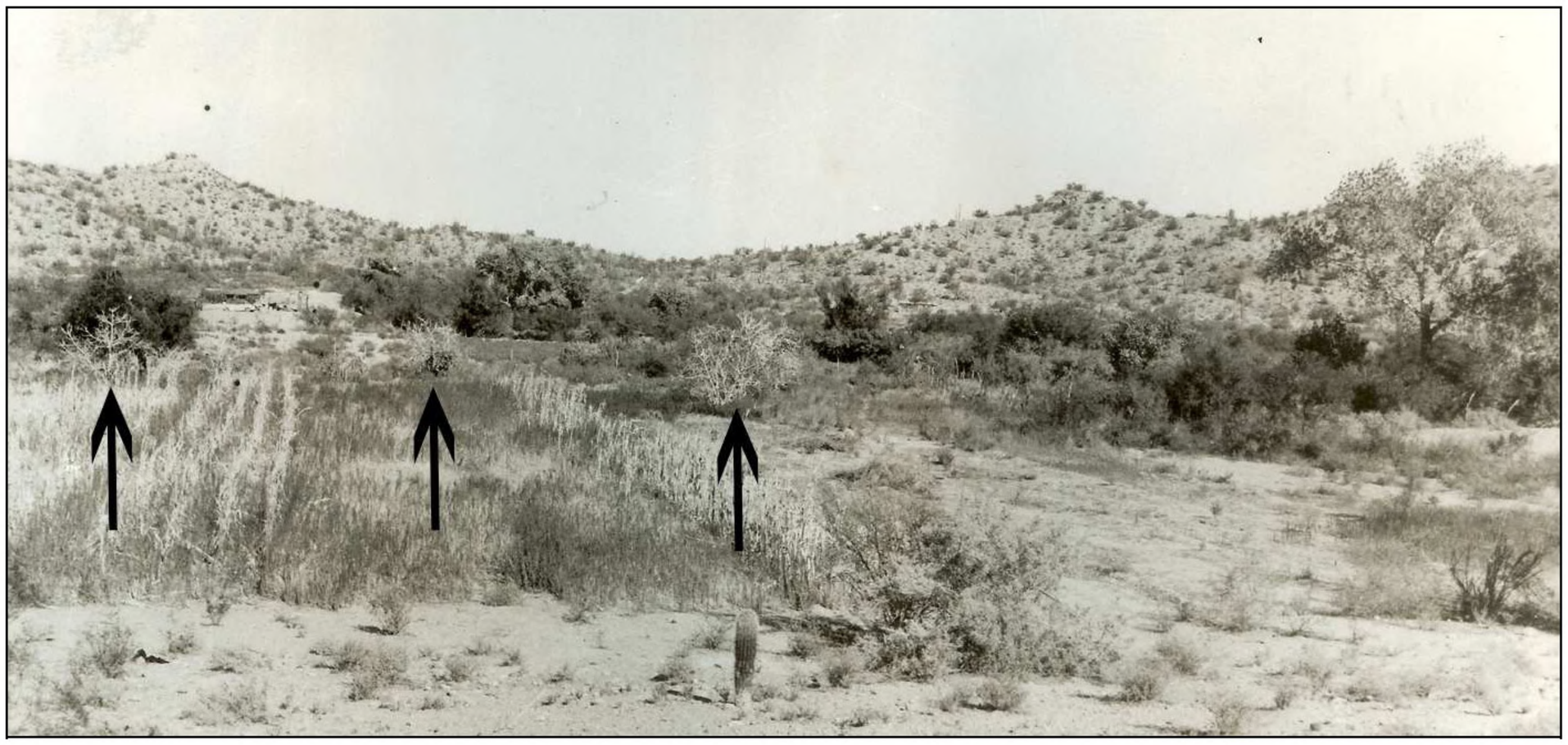

Figure 39. *Ficus carica*. Arrows point to *Ficus* plants along irrigation canals west of Quitobaquito Pond, 1940s, photo by William (Bill) Supernaugh (Organ Pipe Cactus National Monument, black and white photo collection, accession #422).

Morus – Mulberry

Trees and shrubs. North America and Eurasia; 10 species.

Morus microphylla Buckley

Littleleaf mulberry; *mora cimarrona*; gohi. Figure 40.

Woody shrubs to at least 3 m tall. Leaves alternate, mostly winter deciduous, highly variable depending on soil moisture and position on the tree, often 3–8 (10+) cm long including petioles 0.9–2 cm long, the leaf blades broadly ovate, sometimes deeply 3-lobed especially on vigorous new growth, rough (scabrous) on both surfaces; leaf margins serrate-toothed (young, developing leaves with gland-tipped teeth); stipules paired, membranous, unequal in size, and quickly deciduous. Male and female flowers on separate plants, in catkins and wind pollinated, mostly flowering with new growth in spring. Male catkins white, the flowers 5–6 mm wide, with membranous sepals. Stamens 4, longer than the sepals, the filaments flattened; developing stamens inflexed (incurved), held by the cupped sepal-bases, at maturity elastically and suddenly bending outward like a tension-held spring to fling dry pollen in a puff. Female catkins often 1–1.5 cm long; flowers 2.5–3 mm wide, the sepals about as long as the ovary, green with fringed margins. Stigmas thick, 2-branched, yellow-green, and sessile or nearly so. Fruits syncarpous (multiple or aggregate fruits), ± 1 cm long, red or blackish red at maturity, fleshy and tasty but too small to be more than trail snacks.

Ajo Mountains at least in Alamo and Boulder canyons.

Eastward to southeastern and central Arizona, New Mexico, Texas, and Oklahoma, and southward to Durango, Chihuahua, and Sonora.

OP: Alamo Canyon, *Nichol 4 May 1939*. Boulder Canyon, 3000 ft, tree to 12 ft, rare in the Ajo Mts, 3 May 1978, *Bowers 1291*.

Figure 40. *Morus microphylla*. (A) Texas Canyon, Organ Mts, Doña Ana Co., NM, 15 May 2010, photo by Patrick Alexander (SEINet). (B) Male flowers, Tejano Spring, Salero Ranch, Santa Cruz Co., 20 Mar 2014, photo by Sue Carnahan.

ACKNOWLEDGEMENTS

In addition to the gratitudes provided in part 1 in this flora series we thank Susan Davis Carnahan (ARIZ) for copyediting expertise. Additional important information, review, or assistance was provided by Sue Carnahan, Walter Frank Fertig (ASU), George McNeil Ferguson (ARIZ), C. Matt Guilliams (Santa Barbara Botanic Garden), Richard (Rick) Allan Johnson (Silver City, New Mexico), and James (Jim) Thomas Verrier (ARIZ). We acknowledge Lisa Höfler and David Fleming for their assistance in producing images using a Visionary Digital Passport II system, which was facilitated by the ASU Hasbrouck Insect Collection, as well as assistance in the ASU Herbarium by Elizabeth Makings and Les Landrum. For the use of photographs we thank Patrick Alexander, Sue Carnahan, Jillian Cowles, Henry (Hank) Jorgenson, Keir Morse, and David C. Thornburg.

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